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FLORA OF THE SUNDRIBUNS,

BY

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# FLORA OF THE SUNDRIBUNS.

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By D. PRAIN.

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## I.—INTRODUCTION.

The investigation of the flora of the Sundribuns has occupied the attention of the officers in charge of the Royal Botanic Garden since 1796, when Dr. Roxburgh,\* through his friends Dr. William Carey of Serampur and Dr. Buchanan-Hamilton,† received from this region a number of very interesting plants. The assiduity and success with which the investigation of the Sundribuns was conducted by Roxburgh may be gathered from an examination of the *Hortus Bengalensis* published in 1814; one finds there recorded from the Sundribuns several species, such as *Flemingia congesta*, *Mesoneuron cucullatum*, *Bruguiera parviflora*, *Arthrocnemum indicum*, *Salicornia brachiata*, *Dendrobium Pierardi*, *Pteris vittata*, that have not been collected in the area since his day. The indiscriminate liberality with which the specimens collected during the first half-century of the garden's history were distributed by Dr. Wallich‡ has deprived the Calcutta collection of Roxburgh's specimens, so that all of the species enumerated have to be looked for anew in order that Roxburgh's records may be confirmed. Wallich does not himself appear to have given particular attention to the Sundribun flora though among the Wallichian specimens are examples of an interesting plant§ obtained by him from this area in 1817 that no one has found there again. Dr. Griffith, who

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\* Superintendent, 1793—1814.

† Superintendent, 1814—1816.

‡ Superintendent, 1817—1845.

§ *Hibiscus tortuosus* Wall. (not *H. tortuosus* Roxb., which is only *H. tiliaceus* Linn.), of which original examples are present in the Calcutta Herbarium; there are also living plants, introduced by Wallich, in cultivation still in the Calcutta Garden.

acted as Superintendent during the absence of Wallich, himself collected in the Sundribuns, and a few of his specimens from the region are present at Calcutta. Dr. Falconer,\* who succeeded Wallich, next took the matter up and the collections obtained from the Sundribuns during his incumbency include *Cyamopsis psoralooides*, *Acacia Intsia*, *Asphodelus tenuifolius*, which have not been recorded since. Dr. Thomson† who followed Falconer, also made extensive Sundribun collections which include, among plants not recorded before or since his time, *Allophylus Cobbe*, *Acacia tomentosa*, *A. concinna*, *Vitex trifolia*. Dr. Anderson,‡ the next Superintendent, did not himself collect in the Sundribuns but Mr. Kurz,§ during Anderson's incumbency, made several collections in the area; the only species obtained by him that has not been collected since is *Aldrovanda vesiculosa*, a species already known to Roxburgh and to Thomson as a native of the Bengal plain immediately to the north of the Sundribuns. Mr. Clarke,|| who followed Anderson, has given particular attention to the Sundribun flora, his collections include the following species not obtained since his visits to the region:—*Merremia hederacca*, *Coldenia procumbens*, *Teramnus flexilis*, *Lantana triflora*, *Scirpus triqueter* var. *segregata*, *Cladium riparium* var. *crassa*. Sir G. King¶ kept up the traditional interest of the Calcutta Garden in the flora of the Sundribuns and with the assistance of various friends, but more especially of Mr. Gamble, added considerably to the list of Sundribun species; first, and in two cases only, records dating from the period 1871—1878 include *Mallotus repanda*, *Petunga Roxburghii*, *Bridelia stipularis*, *Desmodium umbellatum*.

Shortly after 1880, Mr. Ellis, then Deputy Conservator of the Sundribun Forests, sent to Calcutta some collections of Sundribun plants, the most interesting of these being *Oryza coarctata*, regarding which, in spite of Roxburgh's very definite account of its appearance and habitat, some misconception had arisen, and *Kleinhovia hospita* which had never been obtained in the Sundribuns before and has not been again reported. These Sundribun plants sent by Ellis were added by Mr. Brace\*\* to a special local Sundribun collection already formed by King between 1871—1880. The knowledge of the Sundribun flora afforded by the material thus accumulated was considerable, but it was recognised that it must be far from complete. How incomplete it was

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\* Superintendent, 1845—1855.

† Superintendent, 1855—1861.

‡ Superintendent, 1861—1870.

§ Curator of the Herbarium, 1864—1878.

|| Officiating Superintendent, 1869—1871.

¶ Superintendent, 1871—1897.

\*\* Curator of the Herbarium, 1881—1886.

became apparent when Mr. Heinig was posted to the Sundribuns as Deputy Conservator of Forests ten years later. His duties included the preparation of a working-plan of the Sundribun Forest Reserves; in connection with this duty Heinig sent collections of the important Sundribun species to the Calcutta Herbarium for identification by Sir G. King and by the writer, then Curator of the Herbarium. These collections, though formed with a special and technical object, proved so interesting from the scientific point of view that we begged Heinig to continue his investigations. With this request Heinig complied, and to his collections, carefully made during four or five seasons from 1891 to 1894, is largely due the fact that our knowledge of the Sundribun flora is now perhaps as complete as our knowledge of the Bengal rice-plain itself. During one of Heinig's tours he was accompanied by Mr. G. A. Gammie,\* whose enthusiasm as a collector is well-known.

Heinig's interest in the Flora of the Sundribun forests led to his preparing an account of the topography of the Sundribuns and a sketch of the vegetation of their forests; these were incorporated in the working-plan alluded to above. To this Heinig added, as an appendix, based partly on the specimens of his earlier collections, depending partly on collation, a "List of the Trees, Shrubs and Large Climbers" of the Reserved and the Protected Sundribun Forests. The topographical and descriptive portions of Heinig's account have been largely drawn upon in the chapters that follow. The list appended to the working-plan, though important as a contribution to applied Botany, is less valuable from a scientific point of view. Having regard to the purpose of his report as a whole, Heinig's attention was of necessity chiefly given to such species as are of importance from the Forest Officer's stand-point. Its greatest drawback is, however, its inaccessibility. Heinig has also published an interesting account of the root-system of various species characteristic of the Sundri-forests, as apart from the Mangrove-forests, to which allusion will be made in a subsequent chapter.

A few years later Mr. C. B. Clarke, whose personal knowledge of the Sundribuns is also very intimate, provided an excellent account of the topography and vegetation of the Sundribuns. Clarke's sketch of the region took the form of a Presidential address, delivered at the Anniversary meeting of the Linnean Society of London in 1895, and subsequently published in the Society's Proceedings. This second

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\* Professor of Botany, College of Science, Poona, then officiating as Curator of the Calcutta Herbarium.



account of the Sundribun flora possesses a double advantage over that of Heinig. In the first place it deals not only with the western and central Sundribuns which are under swamp-forest, but with the savannah-swamps of the eastern Sundribuns, a region regarding which we owe to Clarke practically all the knowledge that we possess. Moreover, Clarke's account of the region is readily accessible; that of Heinig forms part of an unprocurable official document. Clarke's paper, however, shares with Heinig's the disadvantage of presenting a list that, though with a different object and in a different manner, is also a selective list. Its purpose cannot be better put than it has been by Clarke himself, who writes:—"This list, containing 69 species, is of course only a portion, perhaps not one-sixth, of the plants which may be collected wild in the Soondrebun. I draw up this list to include those species which I can collect in the Soondrebun, but cannot collect in the Bengal Plain for 100 miles outside the Soondrebun." Clarke's selective list serves the purpose for which it is intended as admirably as does that of Heinig. Both, however,—indeed the two taken together,—fail to provide a complete census of Sundribun plants.

The present paper is the immediate outcome of a visit that the writer, thanks to the kindness of Mr. Lace, Conservator of Forests, Bengal, was able to pay to the Sundribuns during August 1902. An endeavour is here made to convey some idea of the topography of the region, of the nature of the vegetation, and of the origin of the characteristic flora. At the same time the opportunity is taken to provide a census, as complete as the material hitherto available will permit, of Sundribun species. Having regard to the special needs of Forest Officers, to whose efforts, as has been explained, our knowledge of the botany of the region is so largely due, points of economic importance are noted in connection with particular species; a guide to the genera, which it is hoped may be an aid in the identification of these Sundribun plants, precedes this census.

The map accompanying this sketch, which may be usefully consulted in connection with the chapter that follows, and in studying the census of Sundribun species with which the paper concludes, is a reduction from that of Ellison, published in 1873.

## II.—TOPOGRAPHY OF THE SUNDTRIBUNS.

The region known as the Sundribuns forms the southern part of the Gangetic delta between the Hughli on the west and the Megna on the east. The included area consists of a number of low-lying swampy islands formed by the principal distributaries of the Ganges

and their connecting water-channels and creeks. Along the northern border and particularly at the western end there is a certain amount of clearing and cultivation continuous with the cultivated ground of Central Bengal; in the eastern section of the area, between the Madumati and the Megna, cultivation and clearings extend almost to the sea-face. The central and western portions, except for the gradually extending but still comparatively insignificant amount of cultivated ground along their northern fringe, are occupied by extensive forests; those of the central section, between the Madumati (known within the Sundribun area as the Baleswar) and the Raimangal, being Reserved Forests; those of the western section, between the Raimangal and the Hughli are merely Protected Forests. These three very distinct sections form, from west to east, the southern portions of the districts of the 24-Perganahs, Khulna, and Backerganj, respectively.

The courses and relative position of the Hughli and the Megna are well known to residents of Bengal or, if not familiar, are easily traceable on the map; they need not therefore be described here. The intervening rivers are, however, less familiar; for this reason and also because it is only by forming some impression of the entangled nature of their courses and intercommunications that an adequate idea of the Sundribuns is to be obtained, a brief sketch of their ramifications is here given.\*

The *Hughli*, though it forms the western boundary of our area, is not really a member of the Sundribun river-system, and is only incidentally connected with it owing to its giving off at Mud Point an eastern branch known as the Muriganga or the Awatola river which flows southward on the east side of Saugor Island to reach the sea at Dhobelát Island. The first Sundribun river of importance, as we pass eastward from the Hughli, is the *Sabtamúkhi*. This originates near Sultanpur and reaches the sea after a winding course of 50 miles. It is connected with the Muriganga branch of the Hughli by the Gagúdanga Gang and by the Doágra Khal.

The *Thákúrán*, which originates near Jainagar, has also a southerly but less tortuous course of 50 miles before reaching the sea. It increases rapidly in volume on the way and near its mouth is known as the Halúra or Jamerá river. Various khals connect it with the *Sabtamúkhi*, the principal being the Maral Gang and the Kumária.

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\* The details of this sketch of the Sundribun river-system are taken from the fuller account of the topography of the region by Heinig, to which it will be necessary to make frequent references in the pages that follow.

Through the Kúltolla Nadi and the Piáli Nadi it is connected with the Calcutta canals.

The *Mátla* is formed close to Canning Town by the junction of the Bidhyadari, the Khuratya, and the Rampura khals. From its point of origin it flows 60 miles to the sea. It is the largest and deepest of the Sundribun streams, being an arm of the sea rather than a river, navigable throughout its course by ocean-going vessels. With the Calcutta canals the *Mátla* is connected by the Piáli Nadi and the Bidhyadari; with the rivers and channels to the east it is connected by the Rampura Khal and by the Bidda with its many affluents and effluents.

The *Guasábá*, which originates in the net-work of minor channels that lie between the upper reaches of the Raimangal and the *Mátla*, is the next important stream to the east. It has a course of about 45 miles before reaching the sea; with the *Mátla* it is directly connected by the Netadupáni.

The *Raimangal*, which separates the district of the 24-Perganahs from that of Khulna and at the same time divides the Protected Forests from the Reserved Forests, has a course of 50 miles from Sahebkhali to the sea. It is connected with the Rampura Khal by the *Bárakálágáchya*; with the *Guasábá* by the *Terá Banka* and the *Hari Bhánga*; with the *Jabúna*, the next considerable river to the east, by several streams of which the principal are the *Barakúlia*, the *Kalindi Nadi* and the *Atthára Banka*.

These western Sundribun rivers are not in any instance immediate distributaries of the Ganges; they more resemble long arms of the sea than rivers; they are subject to tidal influence throughout their course, and their waters are consequently more saline than those of the rivers in the central and eastern Sundribuns. The effect of all this is distinctly reflected in the character of the vegetation.

Passing eastward from the *Raimangal* the next main-river is the *Jabúna* which begins at Kishenganj and after a course of 200 miles joins the *Raimangal* shortly before the latter reaches the sea. The *Isamati*, soon changing its name to the *Molingchu*, is the next considerable stream. It begins near Halderkhali and after a course of 50 miles through the *Satkhirá* forest, which constitutes the western half of the central Sundribuns, joins the *Barápúnga* near the sea-face. The *Molingchu* and the *Jabúna* are directly connected by the *Fringi*, the *Aburi*, and various other khals.

The *Arpangassia*, formed by the junction, near *Burigoálini*, of the *Kalpatta* and the *Kobaduc* rivers, flows southward for about 40 miles between the *Satkhirá* forest and the forests of the *Khulna Reserves*.

In its lower reaches this river is known as the Barápúnga; it is joined by the Mólíngchu just before reaching the sea and is connected with that river further to the north by the Arabibanki, the Golapatti, and various other streams.

Next after the Arpangassia comes the *Sipsa*, a river which originates at Deluti from the union of a number of khals derived from the Kobaduc on the west and from the Bhadder on the east. After a course of 40 miles it distributes itself as the Mandabári, the Moazál, and the Hondurás rivers. These three again unite to form one stream known as the Múrjhata. This Sipsa river-system is connected with the Arpangassia by the Hansurá, the Batlagang and various other channels. The *Bhadder* leaves the Kobaduc at Jhinárgách near Jessore, enters the forest reserves at the northern end of Sútarkháli and from this point has a course of 25 miles before it is merged in the Sipsa.

The *Pussur*, the next important river, is an effluent of the Bhyrah at Khulna; from this point it flows 85 miles to the sea. It is connected with the Bhadder by the Chunkori, the Bajna, the Daodobe, the Laula, the Barájongana, the Bori, the Arpangassia,\* and the Mángi khals; with the Sipsa it is connected by the Cháila Bogi river. About 20 miles from its mouth the Pussur gives off a considerable river, the Bángará; this last takes a more direct course, of 16 miles, to the sea, receiving on the way the Kágá, the Baráshíala and the Shella rivers. A perfect net-work of rivers and khals connect these tributaries of the Bángará with the Pussur on the west and the Bhola on the east; the chief of these are the Khúrma, the Chachan Gang, the Andramoni, the Mrigya ná, the Shellagang, the Aria Banki, the Char Nangáli, the Pankassia, the Harintáná, the Ghosiángu, the Putia, the Kátá, the Bentmori, the Chandésar.

The *Bhola*, the next main-stream, which begins as a distinct river near Rámpúl, is connected on the north by means of a net-work of khals with the Bhyrah and the Baleswar rivers. After flowing for 40 miles it joins the Pankassia near the junction of that river with the Haringháta.

The *Baleswar*, the next great river, is a direct effluent of the Ganges, the main-stream of which it leaves near Pabna. In the northern part of its course it is known as the Madumati. From Bogi Khal southward it forms the eastern boundary of the reserved forests and separates the district of Khulna from that of Backerganj. In its lower reaches the Baleswar widens considerably and is termed the

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\* Not to be confounded with the *River* Arpangassia.

Haringhāta. With the Bhola on the west it is connected by the Jeodhāra, the Chipa Bāri, the Daunsāgar, the Saronkhola, the Sāpala; its eastern effluents or affluents, permeating the eastern Sundribuns, are the Kocha, the Haltua, the Bishkhalī.

These rivers of the central and eastern Sundribuns, being directly connected with the Ganges, bring down an enormous volume of fresh water, especially during the rains. Their streams are thus less brackish than those of the western rivers, and the character of the vegetation in these divisions of the Sundribuns is thus markedly affected.

The area of this region of interlacing rivers and creeks is about 7,000 square miles; the various water-channels constitute almost one-fourth of the whole, the remaining three-fourths being composed of the low-lying swampy islands which these channels surround. These islands in the eastern or Backerganj Sundribuns are, where not cleared for cultivation, largely occupied by grassy or sedgy savannahs; in the western and central Sundribuns they are mainly forest-clad. The islands are, as a rule, rather higher along the river-banks than they are elsewhere, with somewhat lower and more swampy land inside; as the banks at intervals are cut, and the whole of the interior penetrated and permeated by numberless small creeks, the entire surface of the soil, during the rains and when the rivers are full, is practically under water at every high tide. At low-water during the same season the whole surface is a sheet of somewhat adhesive mud interspersed with shallow pools of standing water. During the cold season, when the body of water in the rivers is smaller, many of the islands become quite dry, and the superficial mud, which is soft and adhesive when wet, hardens and cakes and cracks on the surface.

This mud is composed of a rather tenacious loam, mixed with a certain proportion of fine sand; the whole, owing to the presence of much humus, is of a bluish-grey tint. The surface of this mud has everywhere a thin coating of river-slime. Near and at the sea-face this mud is at times continued under the lowest tide-level; at times, owing to the action of the waves the slime entirely, and the humus and loam largely, disappear, only the fine sand remaining. The subsoil, as seen at low tide along steep river-banks where erosion is in progress, is also loamy, with here and there patches of almost pure sand—vestiges usually of old sand-banks and river-churs, though doubtless sometimes the remains of a former sea face. Less often smaller pockets of a darker and more tenacious loam, approaching in appearance and consistence though not in composition to a clay, are interspersed

among these sandy patches. This subsoil extends, as borings in the Gangetic delta show, to a depth of 120 feet, where it rests on a fairly uniform layer of semi-fluid mud 40 feet in thickness, which is succeeded by a formation of the same character as that which overlies it.

The heavy flow of water in the larger channels that marks the rainy season frequently causes the erosion of the bank against which a current sets. Banks are thus at times washed bodily away; more frequently, however, the root-system of the riparian vegetation holds the actual bank in position and the current only undermines it. When the waters fall to a lower level in the cold weather, such banks, deprived of the support supplied by the pressure of the water, often subside bodily into the stream, with the vegetation growing upon them still intact. The submersion to which the trees are subjected during the higher tides of the subsequent monsoon suffices to kill them, but does not necessarily effect their removal, and the obstruction they now offer to the flow of the stream is apt again to alter the set of the current and to lead to a similar attack by the river on another part of its bank. Where erosion of this kind takes place there is not infrequently a coincident and compensating accretion of shelving muddy bank on the opposite and convex side of the river-reach.

Such newly formed banks become covered with grass which serves to bind the mud already deposited and helps to arrest silt and floating seeds. The latter germinate freely and lead to an extension of the forest over the newly formed land. The peculiar root-systems of many of the resulting species help still further to bind the soil and, by arresting more and more silt, to raise the general level of the bank.

The strong storms from the north-west, so prevalent in the Bengal plain from March till May, and the cyclones that occasionally sweep up from the sea of Bengal at the commencement and the close of the south-west monsoon, do considerable damage to the forests by overturning the taller trees, which break those that check their fall. The trees along the coast-line are, moreover, markedly affected by the steady monsoon winds that blow for half the year; they have in consequence a gnarled and bent and stunted habit of growth.

Throughout much of the western Sundribuns, except in the most northerly islands, the vegetation is largely of the mangrove type though even here the mangroves (*Rhizophoraceæ*) are accompanied by Gégwa (*Excoecaria Agallocha*), by Hīṭal (*Phœnix paludosa*) and by Sâtāci (*Ægialitis annulata*). In the southern islands of the central Sundribuns, where the influence of the tides is strong, the predominance of the mangroves is equally marked. Throughout the

rest of the central Sundribuns and in the northern islands of the western Sundribuns the predominant species is Sundri (*Heritiera minor*)—a circumstance to which the region owes its name of Sundribuns. Associated with Sundri are several characteristic species, notably Amúr (*Amoora cucullata*), Pussur and Dhundol (two species of *Carapa*) and Báen (*Avicennia*), while the river-banks are fringed with various species, the most notable being the Keora (*Sonneratia apetala*). Along the banks too climbing species are most in evidence. Except along the northern borders of the forests, these islands, whether of the Sundri or of the Mangrove class, are remarkably free from dense undergrowth. The savannahs of the eastern Sundribuns are largely composed of Nál (*Phragmites Karka*) though with this are associated several other grasses and a number of tall sedges. Clearings of considerable extent exist throughout the whole of the eastern Sundribuns; in the central and western Sundribuns these are confined to the northern border of the forests. Besides these existing and slowly but steadily advancing clearings there are traces within the forests, and further to the south than any existing cultivation, of former settlements. These vestiges of abandoned occupation, marking perhaps the dwelling-places of salt-makers and Sundribun pirates, are seen in mounds or platforms of higher ground such as may be met with on the left bank of the Mandabari river, not far from Kobaduc, where there are old ruins; another place of the same kind is to be found at Jatta where there are the ruins of an old Hindu temple. The forest in places of this kind is interesting as containing some species, such as the Báel (*Ægle Marmelos*), the Uriám (*Bouea burmanica*), the Gáb (*Diospyros Embryopteris*), the Amaltás (*Cassia Fistula*), that apparently do not occur and possibly could not exist in the swamp-forests; in all probability some of them have, in the first instance, been intentionally introduced.

### III.—NATURE OF THE VEGETATION.

When the vegetation of the Sundribuns is considered in more detail, it is convenient at the outset to separate the clearings, whether existing or abandoned, from the swamp-forests. It is true that in the clearings, especially along embankments and on the banks of creeks and khals, a number of the species characteristic of the swamp-forests still persist. Some of them, like *Pluchea indica*, *Pandanus fascicularis*, *Tamarix gallica*, *Flagellaria indica*, *Dalbergia spinosa*, *Clerodendron inerme*, *Premna integrifolia*, *Suzeda maritima*, *Acrostichum aureum* are actually more plentiful and luxuriant than they ever appear to be in the forests proper. Moreover, there are

some truly maritime species, such as *Phaseolus adenanthus*, *Stictocardia tiliaefolia*, *Agyneia bacciformis*, *Blumea amplexans* var. *maritima*, *Sphæranthus africanus*, *Azima tetracantha*, *Solanum trilobatum*, *Psilotrichum ferrugineum*, *Cyperus scariosus*, *Fimbristylis polytrichoides* var. *halophila*, *Paspalum distichum*, which are plentiful in the clearings but which one cannot find either in the Sundri or in the Mangrove-forests. A few other species, like *Sesuvium Portulacastrum*, *Zoysia pungens*, *Pycneus polystachyus* occur both in the clearings and at the sea-face. The bulk of the species to be met with in the northern clearings are, however, as will be seen on examining the list of Sundribun plants, either species<sup>s</sup> deliberately introduced by man, or weeds such as accompany his crops, appear in the ponds or ditches that he excavates, or spring up by the sides of his paths and on his rubbish-heaps. The mounds and platforms of higher ground within the forests that mark old settlements, supply a number of species that indicate persistence under favourable conditions, on the sites of abandoned clearings, of species possibly originally introduced. The ruins at Mandabari, examined by Heinig and Gammie, and other similar places where Heinig alone has collected, have yielded a considerable number of species of this class. Having regard to the interest of this question the writer took occasion, when visiting the ruins at Jatta in August 1902, to collect every species that was to be found there; this collection supplies several additions to the list, which includes † *Cratæva Roxburghii*, *Flacourtia sepiaria*, \* *Ægle Marmelos*, \* *Zizyphus Enoplia*, † *Eugenia fruticosa*, *Cassia Fistula*, \* *Abrus precatorius*, † *Vangueria spinosa*, † *Ixora coccinea* var. *Bandhuca*, *Diospyros Embryopteris*, \* *Diospyros montana*, † *Cordia Myxa*, \* *Ocimum sanctum*, \* *Antidesma Ghæsembilla*, † *Bouea burmanica*, \* *Zingiber Casumunar*, *Croton oblongifolius*, *Odina Wodier*. The species in this list marked with an \* have been found so far only at Jatta on the mound where there are the remains of a Hindu Temple; those marked with a † have been collected only at Mandabari, or at places of the kind other than Jatta. The remainder, without any distinguishing mark, are common to Jatta and to other ruins. Only one of these species, *Odina Wodier*, has been found in the swamp-forests proper and even there its only locality was a small (and now unused) wood-cutter's camping-ground on the bank of the Ambaria Khal.

The small patch of forest at Jatta on the temple platform and among the ruins yielded the following species in addition to those indicated in the foregoing list:—*Cleome viscosa*, *Tinospora tomentosa*, *Atylosia scarabaeoides*, *Trichosanthes palmata*, *Luffa graveolens*, *Momordica dioica*, *Limnophila gratissima* (from the small sweet-water



temple-tank), *Anisomeles ovata*, *Acalypha indica*, *Trema orientalis*, *Ficus religiosa*, *Ficus infectoria*, *Dioscorea pentaphylla*, *Commelina bengalensis*, *Kyllinga triceps*, *Fimbristylis monostachya*, *Panicum colonum*, *Panicum prostratum*, *Setaria glauca*, and (on the walls) *Adiantum lunulatum*. All of the species here enumerated are plants characteristic of village-shrubberies, hedges and waste-places in the Bengal plain. Except *Luffa graveolens*, which is plentiful in the Upper Gangetic plain, but for which this would appear to be the first record from the deltaic alluvium, all of them are to be found in the districts of the 24-Perganahs and Khulna outside the Sundribuns. Yet none of them have been found anywhere else within the Sundribuns. Their presence in such a spot as the Jatta platform affords evidence of the power possessed by species of this kind, probably mostly casually introduced while the locality was actually occupied, to persist under favourable conditions. Nor could conditions more favourable be readily conceived. The slight degree of artificial elevation given to the site of this old temple, augmented by a further elevation due to the crumbling of the walls of the temple courtyard,\* provides a foothold for these species whereon the conditions to which they are accustomed in the Bengal plain are exactly reproduced. Moreover, the tiny platform is separated by many leagues of low swampy land, suitable only for the species characteristic of the Sundri-forests, from the nearest spot on which competing species can well exist and whence invading forms could readily come. If the conditions afforded by the higher and drier ground of the platform are so sharply contrasted with those of the immediate environment as to prevent surprise that these platform plants have not invaded the swamp-forests, this contrast equally explains why the species of the swamp-forests show just as little tendency to overrun the platform. The surrounding forest, therefore, in place of entering into competition with the species to be met with on the artificially raised mounds that indicate abandoned settlements, affords in reality the best safeguard, to such plants as have already become established there, against outside competition.

The extent to which this is the case is better appreciated when the number of species that are common to the Jatta platform and to (a) other clearings, (b) the sea-face, and (c) the swamp-forests is considered. With other similar mounds or platforms within the limits of the Sundribuns the Jatta one shares only *Glycosmis pentaphylla* and *Breynia rhamnoides*. Species of this class that have

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\* Jatta Pagoda itself is more or less intact and forms a landmark in the navigation of the khals and creeks in its vicinity.

been recorded from other places of the same kind but that are not present at Jatta are also few in number:—*Aphania Danura*, *Zehneria umbellata*, *Clerodendron Siphonanthus*, *Bridelia stipularis*, and *Streblus asper* probably exhaust the list. The shortness of this roll, as compared with that of species possibly intentionally introduced, is noteworthy. With existing clearings the Jatta platform shares only *Vitis trifolia*, *Crotalaria verrucosa*, *Vernonia cinerea*, *Hygrophila phlomoides*, *Pistia stratiotes*, *Paspalum scrobiculatum*. At the sea-face only four species found at Jatta have been collected; these are *Crotalaria verrucosa*, *Capparis sepiaria*, *Ficus Rumphii*, *Derris scandens*. Only three species, and all of them climbers, are common to the Jatta platform and the swamp-forests; these are *Vitis trifolia* and *Vitis latifolia*, the former common, the latter rare, on river-banks only; and *Derris scandens*, common everywhere throughout the forests from the northern boundary to the sea-face.

Besides those species that are maritime or littoral, which occur in the existing clearings but which one does not find either in the swamp-forests or collect, as Mr. Clarke has put it, "in the Bengal Plain for 100 miles outside the Soondrebun," and in addition to the species which one finds in swamp-forests or at the sea-face but which appear to thrive better in the clearings than elsewhere, there are a number of others that persist in the clearings only along embankments and sides of creeks, but are not there more luxuriant than they are in the forests. As examples may be quoted *Canavalia turgida*, *Vigna luteola*, *Derris uliginosa*, *Pongamia glabra*, *Cæsalpinia Nuga*, *Sonneratia apetala*, *Morinda bracteata*, *Wedelia calendulacea*, *Wedelia scandens*, *Ægialitis annulata*, *Ægiceras majus*, *Sarcolobus globosus*, *Sarcolobus carinatus*, *Acanthus ilicifolius*, *Avicennia officinalis*, *Excoecaria Agallocha*. The majority of the species in existing clearings do not, however, occur in the swamp-forests at all. To a considerable extent they are aquatic species, found in sluggish ditches behind embankments raised to keep out the tides, and in pools or tanks of sweet or only slightly brackish water. The leading examples of submerged aquatics are *Ceratophyllum*, *Hydrilla*, *Lagarosiphon*, *Vallisneria*, *Ottelia*, *Ruppia*, *Naias*, two species of *Utricularia*; of floating water-plants *Pistia*, *Aldrovanda*, *Limnanthemum*, *Panicum Myurus* and *P. proliferum*, *Chamæraphis*, *Leersia*, *Ipomœa aquatica*. Other semi-aquatics, partially submerged or growing in very wet places, are *Hydrolea*, *Ammannia*, *Herpestis*, three species of *Hygrophila*, *Hemigraphis*, two species of *Scirpus*, several grasses, *Ceratopteris thalictroides*. Still another group of semi-aquatics or aquatics affect not pools or jhils or still ditches,

but the edges of rivers, khals or creeks. Among these may be enumerated two species of *Typha*, *Alpinia Allughas*, *Scirpus grossus*, *Panicum repens* and, as a species wholly submerged at every high tide, *Cryptocoryne ciliata*. The species of this group are sometimes to be found penetrating for a short distance into the northern forests, but none of them are truly swamp-forest plants.

Terrestrial species confined to existing clearings are plants either only in cultivation, or escapes from cultivation, or field-weeds. Among those cultivated or occurring as escapes we find *Gynandropsis pentaphylla*, \* *Zizyphus Fuzuba*, \* *Cyamopsis psoraloides*, \* *Sesbania grandiflora*, \* *Tamarindus indica*, \* *Parkinsonia aculeata*, \* *Acacia arabica*, *Turnera ulmifolia*, *Trichosanthes cucumerina*, \* *Psidium Guyava*, *Calotropis gigantea*, *Solanum argenteum*, *Angelonia grandiflora*, *Ocimum sanctum*, *Ocimum Basilicum*, \* *Amarantus paniculatus*, \* *Amarantus polygamus*, *Basella rubra*, *Casuarina equisetifolia*, \* *Areca Catechu*, \* *Cocos nucifera*, *Oryza sativa*, *Andropogon squarrosus*. The species marked \* are only found planted; the others are species that have become thoroughly naturalised and in the case of two of these, *Solanum argenteum* and *Angelonia*, this does not appear to be the case anywhere else in India, though *Angelonia* has become similarly naturalised in places in the Irrawaddy delta and near the sea in Tenasserim.

The weeds to be met with in these clearings include *Senebiera pinnatifida*, *Abutilon indicum* and *A. graveolens*, *Malachra capitata*, *Corchorus acutangulus*, *Oxalis corniculata*, *Portulaca oleracea*, *Cardiospermum Halicacabum*, *Crotalaria verrucosa* and *C. Saltiana*, *Phaseolus trilobus*, *Cassia Tora*, *Cucumis trigonus*, *Cephalandra indica*, *Trianthema monogyna*, *Oldenlandia diffusa*, *Vernonia cinerea*, *Ageratum conyzoides*, *Grangea maderaspatana*, *Xanthium spinosum*, *Cnicus arvensis*, *Oxystelma esculentum*, *Dæmia extensa*, *Tylophora tenuis*, *Hoppea dichotoma*, *Coldenia procumbens*, *Ipomœa sepiaria*, *Solanum nigrum* and *S. xanthocarpum*, *Heliotropium indicum*, *Vandellia crustacea*, *Scoparia dulcis*, *Leucas linifolia*, *Amarantus viridis*, *Euphorbia hypericifolia*, *E. hirta* and *E. thymifolia*, *Phyllanthus Niruri*, *Chrozophora plicata*, *Asphodelus tenuifolius*, *Setaria verticillata*, *Andropogon aciculatus*, *Sporobolus tremulus*, *Chloris barbata*, *Eleusine indica* and *E. ægyptiaca*, *Diplachne fasca*, *Eragrostis tenella* var. *plumosa*, *Asplenium esculentum*, *Nephrodium aridum*, *Polypodium proliferum*. This is a meagre list when the area of these clearings is taken into account and may well be incomplete as regards some of the older clearings. The species themselves are, as a rule, unimportant, and the chief interest of the list lies in the indications it affords as to what species first

extend into these newly opened settlements from the Bengal plain, for with only two exceptions these species are all common weeds in the rice-fields or the village shrubberies of Bengal. The exceptions are *Senebiera pinnatifida* and *Xanthium spinosum*, both plentiful weeds near the banks of the Mátla river which do not occur anywhere in the Bengal plain outside the Sundribuns, and both obviously recent introductions to India. It is worth noting, moreover, that among the first species to appear in the newest and smallest settlements are *Ageratum conyzoides* and *Scoparia dulcis*, neither of which is originally a native of India.

Turning now to the Sundribun species that occupy parts which probably have never been subjected to clearing, the first to be considered are those that occur along the sea-face where the line of low sand hills to be met with at various parts of the coast afford conditions very different from those that prevail on the muddy river-banks or in the swampy islands, and provide a foothold for a number of species characteristic of the littoral of South-Eastern Asia generally. The following list includes all that have hitherto been reported; in all cases where the species occurs elsewhere in the Sundribuns this fact is noted:—

*Naravelia zeylanica*: also northern edge of forests.

*Capparis sepiaria*: also among ruins at Jatta.

*Tamarix gallica*: also river-banks throughout the forests and especially in the northern clearings.

*Hibiscus tiliaceus*: also general.

*Thespesia populnea*: planted in the northern clearings; not found in Sundri-forests.

*Vitis trifolia*: also general.

*Allophylus Cobbe* var. *glabra*.

*Odina Wodier*: planted in northern clearings, also on sites of old settlements and camping-grounds.

*Crotalaria retusa*.

*Crotalaria verrucosa*: also northern clearings and old sites.

*Crotalaria Saltiana*: also northern clearings.

*Desmodium umbellatum*: general, but rare.

*Erythrina indica*.

*Canavalia lineata*.

*Vigna luteola*: also river-banks generally.

*Dalbergia torta*: also general.

*Derris scandens*: also general.

*Derris sinuata*.

*Cæsalpinia Bonducella* : also northern clearings and edges of northern forests.

*Cæsalpinia Nuga* : also general.

*Cassia Sophera*.

*Barringtonia racemosa* : also general.

*Sesuvium Portulacastrum* : also river-banks.

*Ixora parviflora*.

*Launea pinnatifida*.

*Ipomœa pes-capræ*.

*Ipomœa longiflora*.

*Ipomœa illustris* : also river-banks

*Dolichandrone Rheedei* : also general.

*Acanthus ilicifolius* : also general.

*Lippia geminata* : also clearings.

*Vitex trifolia*.

*Vitex Negundo*.

*Clerodendron nerifolium*.

*Clerodendron inerme* : also general.

*Aristolochia indica*.

*Cassytha filiformis*.

*Trewia nudiflora* : also in northern clearings, wild.

*Ficus Rumphii* : also on ruins at Jatta.

*Crinum asiaticum* : also general.

*Aneilema nudiflorum*.

*Pycneus polystachyus* : also in clearings.

*Cyperus tegetiformis*.

*Mariscus albescens* : occasional on river-banks but most plentiful at sea-face.

*Fimbristylis ferruginea* : also pretty general.

*Fimbristylis sub-bispicata*.

*Oryza coarctata* : also shelving muddy banks of all rivers.

*Saccharum spontaneum* : also savannahs.

*Zoysia pungens* : also pretty general.

Of the species here enumerated nearly 40 per cent. occur therefore in the Sundribuns only at the sea-face. More striking still, a considerable number of these species, such as *Crotalaria retusa*, *C. Saltiana* and *C. verrucosa*, *Cassia Sophera*, *Derris scandens*, *Naravelia zeylanica*, *Odina Wodier*, *Ixora parviflora*, *Dolichandrone Rheedei*, *Aristolochia indica*, *Aneilema nudiflorum*, *Cyperus tegetiformis*, *Saccharum spontaneum* are not truly littoral species; they therefore owe their presence here to some agency other than that of ocean currents.

The species of the grassy savannah-swamps are not very numerous and include, among sedges, *Cyperus exaltatus* var. *dives*, *Scirpus grossus*, *Cladium riparium* var. *crassa*; among grasses, Ulu (*Imperata arundinacea*), Kashiya (*Saccharum spontaneum*), Guráná (*Andropogon intermedius*) and especially Nál (*Phragmites Karka* var. *cincta*).

The species of the swamp-forests are by habit sharply subdivided into a smaller group of parasitic or merely epiphytic species that do not come in contact with the mud, and a larger group of rooted species. The parasites include *Cuscuta reflexa*, three species of *Loranthus*, and one *Viscum*. The epiphytes include, *Hoya parasitica*, *Dischidia nummularia*, thirteen species of *Orchidaceæ*, seven epiphytic Ferns, a *Lycopodium* and a *Psilotum*. The purely mangrove forests are usually extensive muddy flats covered at every tide by salt water on which the *Rhizophors* themselves are scattered to make an open forest; the individual trees, owing to their habit of sending down stilted adventitious roots, cover considerable spaces, but leave nevertheless wide intervals between. The mud itself, except for the *Rhizophors*, is often devoid of vegetation, though sometimes patches of two salt-worts, *Arthrocnemum* and *Salicornia*, occur on these muddy slopes. Mud-flats that are covered at high-tide only in the rains, and then necessarily with water that is only brackish, are almost always completely covered by a close crop of *Oryza coarctata*. Steeper muddy banks are more usually covered with seedling Báen (*Avicennia*) and with Hargóza (*Acanthus ilicifolius*) bushes in the central Sundribuns; in the western islands Sátári (*Ægialitis*) is usually associated with and sometimes outnumbers Báen on such banks. The tops of the banks, especially along the larger rivers, are often exclusively occupied by Keora (*Sonneratia apetala*)—most graceful of Sundribun trees and particularly abundant along the convexities of river-reaches. Smaller khals have a more varied riparian vegetation; Ora (*Sonneratia acida*), Báen (*Avicennia*), Dhundol (*Carapa abovata*), Koilsha (*Ægiceras majus*), Dakur (*Cerbera Odollam*), Goría (*Kandelia*), Karanj (*Pongamia*), Bhola (*Hibiscus tiliaceus*), Amanta (*Dalbergia spinosa*)—as frequently erect and shrubby as it is climbing, Gorán (*Ceriops*), Kripa (*Lumnitzera*), Goniári (*Premna integrifolia*), Butráj (*Clerodendron inerme*), Hital (*Phoenix paludosa*), being there especially plentiful. On the side of this riparian fence next to the stream occur frequent patches of Golpátta (*Nipa*) and of the stately grass *Myriostachya Wightiana*. Immediately within this fence is the favourite habitat of Kúmia (*Barringtonia racemosa*), of Gorshingiah (*Dolichandrone Rheedei*) and of Bhaila (*Intsia*). Still narrower channels have frequently only

Koilsha (*Ægiceras*) and associated with it Kedar Sundri (*Brownlowia*) as representatives of the riparian fence. The narrowest creeks of all are often lined, to the exclusion of other species, by a fringe of Golpátta (*Nipa*).

It is on the riparian fence that the climbing species are most plentiful; the commonest is the ubiquitous *Derris uliginosa*, followed in order of frequency by *Finlaysonia*, *Vitis trifolia*, *Dalbergia torta*, *Sarcolobus globosus*, *Parsonsia spiralis*, *Dregea volubilis*. *Derris scandens* at times also occurs here but is more plentiful inside the forests than on their margins; *Finlaysonia obovata* also is not uncommon within the forests, the other creepers rarely occur there.

Just behind the riparian fence occurs any undergrowth to be met with. This consists mainly of Kewa (*Pandanus fascicularis*) with occasional tufts of *Scirpodendron*, clumps of *Crinum*, and bushes of Hargóza (*Acanthus ilicifolius*). Except, however, in the most northern forests the undergrowth is rarely dense and often there is none. Overhead is the Sundri forest composed mainly of that tree (*Heritiera minor*); of larger size in the central than in the western forests and in the northern islands of either than it is further south. Associated with Sundri on the higher ground is Báen (*Avicennia officinalis*)—the largest of Sundribun trees often reaching 10, sometimes 12-15 feet in girth, and Gégwa (*Excoecaria*), both fairly common; also Shingra (*Cynometra*) which is less plentiful. In the more swampy interior of the islands the companion trees to Sundri are still Gégwa; with it are Kedar Sundri (*Brownlowia*), Amúr (*Amoora cucullata*) and Pussur (*Carapa gangetica*). As we pass southwards the Sundri diminishes in frequency while Gégwa remains, till at length the forests become almost pure Gégwa. By this time, however, the riparian fence characteristic of the Sundri-forest has been replaced by Rhizophors which, as we pass onwards towards the sea, ultimately supplant the Gégwa and give the pure mangrove forest with which we commenced.

Besides the absence of undergrowth, a feature which the Sundri-forest shares with the mangrove- or the Gégwa-forest, the most remarkable feature of the Sundri-forest is the characteristic crop of vertical blind root-suckers, emitted by the roots of various species, notably by those of Sundri itself. The species besides Sundri (*Heritiera minor*) which develop these suckers are Amúr (*Amoora cucullata*), Pussur (*Carapa gangetica*), Ora (*Sonneratia acida*), Keora (*Sonneratia apetala*), Báen (*Avicennia*) and Hítal (*Phœnix paludosa*).

In the case of *Phœnix paludosa* the roots, which pass almost vertically downwards, give off numerous branches that pass vertically upwards. The vertical branches are usually small and somewhat inconspicuous, nor do they differ greatly in appearance from the down-

ward growing roots from which they arise. Their structure is, however, peculiar and is apparently adapted to serve a respiratory function.\*

The root-suckers of Báen (*Avicennia*), though also small, are sufficiently conspicuous owing to the main roots passing horizontally for great distances from the tree to which they belong and giving off, from their upper side, lines of soft pith-like roots that rise well above the surface of the mud in which the true root is buried. These root-suckers of *Avicennia* are much too soft and flexible to serve either as mechanical supports to the tree or to any great extent as agents in arresting silt and debris. Their chief function appears to be respiratory.

In the case of the remaining species a very decided mechanical effect is produced by these root-suckers. Keora (*Sonneratia apetala*), which is characteristic of river-banks, sends out very wide-spreading roots under the surface of the mud. These roots emit long close lines of root-suckers up to distances of 150 feet or more from the parent stem. The lines of vertical root-shoots act as spurs that deflect the impinging current, lead to accretion of silt, and greatly aid the roots themselves in holding on to the muddy substratum. The shoots that rise from the distal and deeper ends of roots that are nearest to the stream, rise higher and are larger than those on the upper part of the slope and nearer the stem of the tree. In places where the set of a current has become altered, so that the silt thus accumulated is again being removed, it is noticeable that, as the erosion goes on, a deeper layer of roots and root-shoots than the one actually visible at the surface, but belonging to the same tree, becomes bared. These are roots with their suckers that had at some former period become completely buried, when their place was taken by a newer and more superficial system. Roots and suckers thus laid bare after previous complete burial, appear invariably to be dead. The roots of Keora are slender and conical from a rather thick base and are usually quite discrete. Those of Ora (*Sonneratia acida*) are in most respects like those of Keora but are often agglutinated at their bases. In both species they are tough and flexible but not very rigid.

The suckers rising from the roots of Pussur and Amúr, both of which species affect the more low-lying swampy localities in the interior of the islands, are sometimes as much as 3 feet long, the tips of the longest suckers appearing just above the surface of the water at the highest tides. The majority of the suckers hardly reach this level. In both Pussur and Amúr the suckers are cylindric but taper more

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\* For an account of the structure of these roots a paper by Gage, *On the Anatomy of the Roots of Phoenix paludosa*, in Sc. Mem. Med. Off., Army of India, XII., 103 (1901), should be consulted.



gently than those of Keora, have blunter points and are more rigid and less flexible.

In the case of Sundri the suckers are not so closely set as they are in the two *Sonneratias*; they are also more rigid and less flexible, in this respect resembling the suckers of *Amoora cucullata*. But they differ from all the other root-suckers in being somewhat compressed laterally instead of being cylindric and in arising only at points where the true Sundri roots branch instead of arising in lines along the upper surface. The suckers nearer the stem are moreover wider, *i.e.*, have a greater long diameter, than those more remote; the ones nearest the trunk occasionally coalesce with and ultimately form part of the buttresses thrown out at the base of the stem. The root-suckers of Sundri, which prefers to grow on slightly higher ground than Pussur and Amúr, are rarely so long as in these species.\* From this fact and from his observations regarding the upper limit of their growth in all the species, Heinig concludes that, besides serving as mechanical supports, these root-suckers in every instance act as respiratory organs. The fact that the roots and suckers of Keora which become completely covered by silt die, and have their places taken by a new and more superficial series of roots and suckers, tends to confirm this conclusion. The conditions under which the species that constitute the Sundri-forests exist are such as to render the suggestion very probable, and the fact that other species, such as Góngwa, are not similarly endowed seems surprising. But in connection with this it is remarkable that though the two *Sonneratias* share the habit, the two *Carapas* do not; moreover, while Sundri (*Heritiera minor*) has root-suckers, another maritime species, *Heritiera littoralis*, not present in the Sundribuns but common on many other Indian coasts, has none.

The extent to which the species characteristic of the Sundribuns accommodate themselves to a greater or lesser degree of brackishness is rather variable. The Rhizophoræ are plentiful near the coast but some of them, particularly Gorá (*Kandelia*), Gorán (*Ceriops*) and Kankra (*Bruguiera gymnorhiza*) are to be found naturally on the banks of the larger rivers even up to the northern boundary of the forests. Their occurrence so far upstream is, however, quite casual, and none of them can be said to extend naturally outside the Sundribuns. Even so near to their natural area as at Calcutta or Chander-

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\* For an interesting account of the root-suckers of the Sundribuns consult a paper by Heinig in *Journal, Asiatic Society of Bengal*, Vol. 62, pt. 2, p. 158 (1893). In this paper no reference is made to the presence of root-suckers in Hítal (*Phanix paludosa*).

nagore, the only ones that can be got to thrive and to flower are *Kandelia Rheedei* and *Bruguiera gymnorrhiza*. Sundri (*Heritiera minor*)—and what is true of Sundri holds good for Amúr, Pussur, Kedar Sundri and Shingra—is to be found everywhere throughout the forests, but it diminishes considerably in size as we pass westward to where the rivers become more æstuarial and carry outward less fresh water, and diminishes still more both in size and in quantity as we pass southward to where the mangroves predominate. It reaches its highest pitch of development and forms a far purer forest in the northern Bagirhat and in the Khulna forests, where the islands are flooded during the rains by the fresh water of streams distributed immediately from the Ganges. While, however, this is the case, Sundri and its companions do not extend northward into the Bengal plain and even so near its proper habitat as Calcutta, it cannot be induced to thrive so well as the nearly allied *Heritiera littoralis* which is, in its proper habitat, more tolerant of salt-water than *H. minor*. Góngwa (*Excoecaria Agallocha*), the only species in the Sundribuns that grows with equal vigour in localities suitable for Sundri or for the mangroves, extends naturally into the Bengal plain, and is as healthy and vigorous at Calcutta as it is in its swamp-forest habitat. Keora (*Sonneratia apetala*), which practically ceases southward where the mangroves begin, extends northward a little way into the Bengal plain but only on the banks of tidal rivers and only where the water is distinctly brackish at high tide. The species survives but does not thrive at Calcutta. Hital (*Phoenix paludosa*) does not appear naturally to extend into the Bengal plain, but in spite of this it attains, as a planted species in the Calcutta Garden, to a height of stem surpassing anything to be met with in the Sundribuns. Gollpatta (*Nipa*) can be kept alive at Calcutta, but does not there grow vigorously. Amanta (*Dalbergia spinosa*) also extends along river-banks well into the Bengal plain, but the nearly related Panchioi (*Dalbergia torta*) disappears from the banks of the rivers before the northern boundary of the swamp-forest is reached.

A few species seem even more indifferent than Góngwa and extend naturally northwards along river-banks as far as the influence of the tides is felt at all. The best instances of truly littoral species that thus accompany the tide-flow are *Hibiscus tiliaceus*, *Thespesia populnea*, *Erythrina indica*, *Canavalia turgida* (*C. lineata*, though so nearly related, does not), *Phaseolus adenanthus*, *Vigna luteola*, *Derris uliginosa*, *Pongamia glabra*, *Morinda bracteata*, *Stictocardia tiliaefolia*, *Acanthus ilicifolius*.

The 334 species so far reported from the Sundribuns belong to 245 genera and to 75 natural orders. Of these 75 orders, no fewer,

than 32 are represented by only one genus; while as many as 27 of these 32 have only one species. Other 15 natural orders are represented by only 2 genera; other 7 by only 3 genera; yet another 7 by only 4 genera. Only 2 natural orders, *Scrophularinæ* and *Rubiaceæ*, have 5 genera apiece and 3 orders, *Cucurbitaceæ*, *Verbenaceæ* and *Palmeæ*, have 6 genera. Of natural orders with more than 6 genera, *Orchidaceæ* have 8, *Cyperaceæ* and *Polypodiaceæ* each 9, *Asclepiadaceæ* and *Compositæ* each 11, *Euphorbiaceæ* 14, *Graminæ* 18, *Leguminosæ* 25. As regards number of species, *Leguminosæ* with 38 species leads; followed by *Graminæ* with 29; *Cyperaceæ* with 19; *Euphorbiaceæ* with 16; *Polypodiaceæ* with 14; *Orchidaceæ* with 13; *Asclepiadaceæ* with 12; *Convolvulaceæ* with 9; *Cucurbitaceæ* with 7; *Malvaceæ*, *Rhizophoreæ*, *Rubiaceæ*, *Urticaceæ* and *Palmeæ* each with 6; the rest with 5, or fewer than 5.

Of the 245 genera, no fewer than 190 are represented by only one species; of the remaining 55, as many as 35 have only 2 species; other 11 have only 3 species; other 6 only 4 species each; one has 5 species; only two genera, *Ipomœa* and *Panicum* have each 6 species. The subjoined table gives a brief *resumé* of the composition of the Sundribun flora from the taxonomic point of view:—

TABLE I.—*Systematic Synopsis of Sundribun Plants.*

	Orders.	Genera.	Species.
Thalamifloræ . . . . .	10	18	20
Discifloræ . . . . .	9	17	21
Calycifloræ . . . . .	10	46	64
Corollifloræ . . . . .	19	63	86
Incompletæ . . . . .	9	30	39
Monocotyledons . . . . .	15	59	87
Vascular Cryptogams . . . . .	3	12	17
TOTALS . . . . .	75	245	334

#### IV.—ORIGIN OF THE SUNDRIBUN FLORA.

The geographical position and the physical condition of the Sundribuns show that they are only part of the alluvial plain of Lower Bengal, the whole of which is of recent geological formation, and that, as a matter of fact, the process of extension of that plain is here going on under our eyes. Moreover, when borings are made or deep tanks or canals are dug in the Lower Gangetic Plain at a considerable distance to the north of the existing Sundribun forests, a layer of soil is found at no very great depth in which are present the remains of species that now exist in the Sundribuns, but that have retreated from

the actual neighbourhood of the excavation. On the other hand, we find places well to the south of the northern limits of the existing Sundri-forest where, on steep banks that are subject to erosion, a layer of broken bricks and pottery is being exposed at a level well below that of the high tides of the rainy season. Whether these facts, taken in conjunction, indicate that the Sundribun area has been subjected to alternations of elevation and subsidence is an open question. Whatever may be the truth in this respect there is no doubt that all of the surface soil in the lower Gangetic delta is newly-formed land. This being the case, there can be no such thing in the Sundribun forests, savannahs or clearings as an indigenous species. The nature of the flora, with its extraordinary proportion of genera and even of natural families that, so far as this region is concerned, are monotypic, points to the same conclusion. An examination of the Sundribun flora therefore resolves itself into a discussion of the dispersal and the distribution of its species; a study of how and whence the plants now present in the area have been introduced. The simplest method of dealing with the problems involved is to deal first with the dispersal of these species and to commence with those plants that inhabit the swamp-forests and constitute the more characteristic part of the flora. The different possible agencies of dispersal may be accepted as (1) *Human*, by which the introduction may have been (a) *intentional*, as in the case of cultivated or planted species, and (b) *inadvertent*, as in the case of weeds of fields or waste-places (2) *Bird*, and then either (a) by *water-birds* that carry seeds of small size or, rarely, spores attached to their feet, or to the feathers near the base of their bills, along with pellets of mud; or (b) by *fruit-eating* birds that void uninjured the seeds of fleshy fruits or seeds provided with a mace: (3) *Wind*, carrying seeds or spores that are sufficiently small and light, or seeds or fruits provided with wing-like expansions, or with a coma or pappus, that may act as a parachute: (4) *River*, bringing down from the Indian Hills or from the Gangetic plain seeds and fruits of various kinds: (5) *Sea*, bringing, by means of currents and tides, the seeds and fruits of, usually, littoral species from other shores.

**Swamp-Forests.**—Species introduced by man whether by accident or by design, are not to be expected in the swamp-forests: the only unequivocal instance is *Odina Wodier*, a species planted in existing clearings and plentiful where there are vestiges of former occupation; this was also obtained by the writer at a small camping-ground used by wood-cutters on the bank of the Ambaria khal. Nor are species likely to be introduced by water-birds to be expected in these forests; none have so far been found. Species in all probability introduced

by fruit-eating birds are not plentiful; the three species of *Vitis*, with the three species of *Loranthus*, a species of *Viscum*, a *Cuscuta*, a *Ficus* (*F. retusa* var. *nitida*) and the *Leea*, are perhaps the least equivocal instances. Except the *Leea*, which may equally well have been introduced by water, it is to be noted that all these species are either climbers or parasites. The *Ficus*, it is true, does not persistently climb, but it begins life as an epiphytic climber. Species introduced by wind agency are nearly thrice as numerous. They include thirteen epiphytic orchids, viz.:—an *Oberonia*, two *Dendrobia*, a *Cirrhopetalum*, a *Trias*, two *Luisiæ*, three *Saccolabia*, two *Sarcanthi*, and a *Cleisostoma*, all with minute and very light seeds; eight epiphytic vascular Cryptogams, viz.:—*Asplenium falcatum*, *Polypodium quercifolium*, *adnascens* and *irioides*, a *Vittaria*, a *Drymoglossum*, *Acrostichum scandens*, a *Lycopodium* and a *Psilotum*, all reproduced by means of minute spores. The obscure *Pteris* (*P. vittata*), if one may judge from its figure and description, should belong to this category. The other wind-introduced species are mostly climbers, their seeds being provided with a pencil of hairs that serves as a parachute; they include *Parsonsia spiralis* (Apocynæ), *Dregea volubilis* and *Finlaysonia obovata* (Asclepiadaceæ) which are rooted in the ground, with two epiphytic Asclepiads, *Hoya parasitica* and *Dischidia nummularia*. The only swamp-forest tree for which introduction by wind seems unequivocal is *Dolichandrone Rheedei*, which has seeds with large membranous marginal wings. One non-epiphytic fern, *Acrostichum aureum*, is possibly also a wind-introduced species.

Species that almost certainly owe their presence in the Sundribun forests to their seeds having been washed down from Upper India or from the Himalayan slopes by the great rivers are less numerous than those introduced by wind-agency. As might be expected they vary considerably in habit and include among herbaceous forms *Alpinia Allughas*, *Typha elephantina*, and *T. angustata*, *Cryptocoryne ciliata* and *Oryza sativa*; among climbers, *Teramnus flexilis*, *Derris scandens*, *Caesalpinia Nuga*\*, *Mezoneuron cucullatum*, *Entada Pursætha*, *Acacia concinna* and *A. Intsia*, *Mallotus repanda*, *Ipomœa paniculata*, *Calamus tenuis* and *Dæmonorops Jenkinsianus*; among erect species, *Tamarix gallica*, *Micromelum pubescens*, *Flemingia congesta*, *Acacia tomentosa* and *Cyclostemon assamicus*. The two most striking features among the species of this list, as will be seen on consulting the systematic census of Sundribun plants, are the

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\* This species is also capable of introduction by the sea, and is plentiful on the coasts of the Andamans: in our northern forests it is, however, possibly a riverine immigrant; at the sea-face, where it also occurs, it is quite probably a sea-introduced species.

extent to which these species are confined to the northern forests only, and the number of them that have been only once reported—often only in the old collections from 1796 to 1856. The latter fact suggests naturally the question whether some of them deserve to be considered truly Sundribun species and whether, though now and again one of them has been met with, all or any of them are capable of persisting in the Sundribuns. The only one that is plentiful throughout the forests is *Derris scandens*; the only one for which the agency is doubtful is the *Cryptocoryne*: not one of them, it will be observed, is a tree of any size.

The rest of the swamp-forest species, 58 in number, are probably all sea-introduced species. For the majority this agency is unequivocal; the case of *Paramignya longispina* appears doubtful, yet it is difficult to imagine any other agency as responsible for its presence. Another equivocal case is that of *Kleinhovia hospita*. This is one of Ellis' discoveries and, next to his rediscovery of *Oryza coarctata*, is the most interesting. Ellis only collected it once and has given no exact locality for his specimens, so that it might be suggested that this is not a swamp-forest species but one of the trees characteristic of the sites of abandoned settlements or even a tree planted in some recent clearing. The vernacular name connoting it is given as Bhola, a name usually applied to *Hibiscus tiliaceus* which, in the shape and venation of its leaves, *Kleinhovia* somewhat resembles. The fact that the vernacular name used should be that properly belonging to one of the most plentiful and familiar of Sundribun species, hardly suggests that *Kleinhovia* is an introduced species; had it been so, some qualifying epithet would almost certainly have been employed by a native wood-cutter or forest official. The indication rather is that the tree is a Sundribun species, but that it is so rare as not to have a name of its own. This use of the vernacular name, coupled with the fact that none of Ellis' other specimens are from existing settlements, practically disposes of the suggestion that his *Kleinhovia* was a planted tree. It was carefully looked for in all the settlements visited by the writer, but was nowhere seen; it has never been sent from any settlement by Heinig; the tree is, moreover, of little economic importance and is not at all a likely species for settlers to introduce. The date of the introduction of the species to Bengal by Roxburgh, who received it from the Moluccas, was 1796, by which time the old settlements of pirates and salt-smugglers in the Sundribuns had either been abandoned or their inhabitants had ceased to hold such intercourse with Calcutta as the introduction of new and rare trees would involve. The suggestion that Ellis' specimens are from some place like Mandabari or Jatta may therefore be ignored. The fruits of

*Kleinhovia* are well adapted to dispersal by ocean currents; its distribution is very similar to that of *Scirpodendron*, *Cladium*, *Brownlowia*, *Phoenix paludosa*, *Myriostachya* and other characteristic and well known Sundribun species. The fact that the species was introduced to the Calcutta Garden from the Moluccas by Roxburgh in 1796 is no more an argument against its being wild in the Sundribuns than are the facts that *Intsia* was introduced to the same garden from Singapore in 1835, and *Dolichandrone* was introduced from Southern India in 1830, arguments against these two, which are both wide-spread trees in the Sundribun swamp-forests, being truly wild in our area.

The species introduced by the sea are variable in habit; a few are herbaceous, like *Myriostachya*, *Scirpodendron*, *Oryza coarctata*, *Mariscus albescens*, *Crinum asiaticum*, *Salicornia brachiata*, *Arthrocnemum indicum*; a few are climbers, like *Flagellaria indica*, *Acanthus volubilis*, *Ipomœa illustris*, *Merremia hederacea*, *Sarcobolus globosus* and *S. carinatus*, *Dalbergia torta* and *D. spinosa*, *Derris uliginosa*, *Canavalia turgida*, *Mucuna gigantea*; or rambling shrubs, like *Hibiscus tiliaceus* and *H. tortuosus*, *Paramignya longispina* and *Salacia prinoidea*; the rest are erect shrubs, like *Acanthus ilicifolius*, *Clerodendron inerme*, or trees of smaller or larger size. The most notable feature of the Sundribun swamp-forest flora is that half the species are probably sea-introduced, the balance owing their presence chiefly (1) to wind-agency and (2) to introduction by large rivers; a few have come (3) owing to the agency of frugivorous, but none owing to that of wading birds; only one owes its presence to (4) man.

**Grass-Savannahs.**—The species that forms the basis of these grassy swamps is *Phragmites Karka* var. *cincta*; this doubtless owes its presence here to wind-agency, which in all probability is also accountable for the presence of *Imperata*, of *Saccharum spontaneum* and perhaps, though in the last instance introduction by rivers is also conceivable, of *Andropogon intermedius* as well. The sedges present cannot well be wind-introduced species, but whether they are to be looked on as introductions by water-birds, by rivers, or by the sea is an open question, since all three agencies of dispersal are conceivable. Having regard to their distribution, however, one may conclude that the *Cladium* is probably a sea-introduced species, while *Scirpus grossus* and *Cyperus exaltatus* may be considered introductions either by means of water-birds or by rivers. The two bulrushes, also found on the margins of such grassy swamps, may similarly be introductions either by water-birds or by rivers; *Acrostichum aureum*, which is also present in such places, may have been dispersed by birds

or by wind. None of the savannah species are likely to have been introduced by fruit-eating birds or by man and, on the whole, the inanimate agencies of dispersal,—winds, river-currents or tides—are the probable agencies for all.

**Sea-Face.**—The species that constitute the fence of shrubs and creepers immediately behind the line of low sand-hills that occur along the coast wherever the actual shore is subject to the influence of the waves, and the species that are to be met with on these sand-hills themselves, exist under conditions as to light and soil very different from those that prevail in the swamp-forests and, as regards soil at least, quite unlike those offered by muddy banks that shelve under the sea whereon the salt-worts grow, or that exist in the swamp-savannahs. This being the case, it is not surprising to find, as we did in the preceding chapter, that 40 per cent. of the Sundribun sea-face plants are confined to this sea-fence or to these sand-hills.

None of these sea-face plants have been introduced by man, and none are likely to have been introduced by water-birds. Frugivorous birds may, however, be responsible for the introduction of *Capparis sepiaria*, though this is just as likely to have been brought by the sea ; of *Allophylus Cobbe* ; of *Vitis trifolia* ; of *Ixora parviflora*, though this has more probably been washed down from Upper India by one of the rivers ; of both species of *Vitex*, though both are common sea-coast species in the Andamans and Burma, and may be here sea-introduced, while, for that matter, *V. Negundo* at least may have been brought down by the rivers ; of *Cassytha filiformis*, though this, which is a frequent parasite on *Ipomœa pes-capræ* on Andaman sea-beaches, may have come here by the sea ; of *Ficus Rumphii*, though this too may be sea-introduced as it is a very common, indeed almost unfailing denizen of the corresponding sea-fence on the shores of the Andamans. Bird-agency, then, seems unequivocal only in the case of two species. Wind-agency is perhaps unequivocal in the case of *Naravelia zeylanica*, *Dolichandrone Rheedei*, and *Saccharum spontaneum* ; it may explain the presence of *Aristolochia indica* though this has more probably been washed down by the rivers, and of *Launea pinnatifida*, though this is more likely to have been brought by the tides.

Species at the sea-face almost certainly washed down by rivers are *Cassia Sophera*, *Tamarix*, *Crotalaria retusa*, *C. Saltiana* and *C. verrucosa*, *Aneilema*, *Lippia geminata*, *Cyperus tegetiformis* ; those probably introduced here by this agency are *Odina Wodier*, *Derris scandens*, *Ixora parviflora*, *Aristolochia indica*, *Trewia nudiflora*.



Another species which may have been thus introduced, but which is more probably an instance of introduction by the sea, is *Cæsalpinia Bonducella*, a shrub plentiful behind Andaman sea-beaches. The remainder of the sea-face species are probably unequivocal instances of sea-introduction, so that two-thirds of the sea-face flora as against only one half of the swamp-forest flora is of truly littoral type. A few of the species, like *Derris scandens*, *Dolichandrone Rheedei*, *Barringtonia racemosa*, *Acanthus ilicifolius*, *Crinum asiaticum* are to be found within the swampy islands, but the majority of the sea-face plants that are also to be found in the swamp-forests are there strictly limited to the banks of the large rivers. Such species are *Vitis trifolia*, *Desmodium umbellatum*, *Vigna luteola*, *Dalbergia torta*, *Cæsalpinia Nuga*, *Ipomœa illustris*, *Clerodendron inerme*, *Sesuvium Portulacastrum*, *Mariscus albescens*, *Oryza coarctata*. A number of the sea-face plants, however, that find the conditions offered by the swamp-forests uncongenial, recur on the sites of abandoned settlements, along the northern fringe of the forests, or in the existing clearings; examples that may be cited are *Naravelia zeylanica*, *Capparis sepiaria*, *Thespesia populnea*, *Crotalaria verrucosa* and *C. Saltiana*, *Erythrina indica*, *Trewia nudiflora*, *Ficus Rumphii*, *Pycneus polystachyus*, *Fimbristylis ferruginea*, *Zoysia pungens*; the last named is also met with at the upper margins of newly-formed mud-banks not yet afforested by swamp-forest species. One sea-face species, *Saccharum spontaneum*, also occurs in the grassy savannahs.

**Abandoned Sites.**—In places where there are vestiges of former occupation by salt-smugglers or dacoits or where, as at Jatta, a settled population had at some former time obviously existed, a number of characteristic species are to be found; these have been fully dealt with in a former chapter and, as might be expected from the topography and the physical conditions of such localities, they do not include any species likely to have been introduced by the sea. Nor can rivers be held directly responsible for the introduction of any of the species. Two for which this means of dispersal is conceivable are *Crotalaria verrucosa* and *Derris scandens*, but of these the first is more likely, in places of the kind, to have been inadvertently introduced by man as a field-weed; the *Derris*, though doubtless brought down from Upper India or Assam by rivers in the first instance, has more probably been carried to such spots by wind from the neighbouring swamp-forests. As regards wind-agency too the number of introductions is very small, for even if we consider *Derris scandens* as here locally wind-introduced, we have only five species for which this means of dispersal is at all likely, the other four being *Vernonia cinerea*, which is just as likely to be an inadvertently introduced weed; *Dioscorea pentaphylla*,

which may also be a weed ; *Hemidesmus indicus* and, finally, *Adiantum lunulatum* for which this agency is doubtless unequivocal. The inanimate agencies, for these particular sites, count for little as compared with the animate ones.

Water-birds are probably responsible for the introduction of *Limnophila gratissima*, *Hygrophila phlomoides*, *Pistia stratiotes* and perhaps for that of *Paspalum scrobiculatum* and *Panicum colonum*. Fruit-eating birds, however, have been a more active agency and are probably responsible for the presence of *Vitis trifolia* and *V. latifolia*, of *Breynia rhamnoides* and *Bridelia stipularis*, of *Aphania Danura*, *Olex scandens*, *Glycosmis pentaphylla* and *Tinospora tomentosa*, of *Trema orientalis*, of *Ficus Rumphii*, and of the four Cucurbitaceous plants found on these abandoned sites. Other species, possibly thus introduced, though the agency is not unequivocal since all of them may conceivably have been deliberately introduced by man, are *Clerodendron Siphonanthus*, *Streblus asper*, *Eugenia fruticosa*, *Ficus religiosa* and *F. infectoria*, *Antidesma Ghaesembilla*; perhaps *Flacourtia sepiaria* might be classed with these.

Human agency may be held less equivocally responsible for the deliberate introduction of *Cratæva religiosa*, *Ægle Marmelos*, *Zizyphus Ænopia*, *Bouea burmanica*, *Odina Wodier*, *Cassia Fistula*, *Vangueria spinosa*, *Ixora coccinea* var. *Bandhuca*, *Diospyros Embryopteris*, *D. montana*, *Cordia Myxa*, *Ocimum sanctum*, *Zingiber Casumunar*; is not improbably responsible for the presence of *Abrus precatorius*, though this may have been inadvertently introduced; of *Croton oblongifolius*, the existence of which is not otherwise easily explained; and of *Streblus asper*, *Flacourtia sepiaria* and *Antidesma Ghaesembilla*: *Clerodendron Siphonanthus*, too, is a species that may conceivably have in the first instance been planted.

Species that are mere weeds of cultivation elsewhere, and that in these clearings almost certainly owe their presence to inadvertent introduction by man with his crops are *Cleome viscosa*, *Atylosia scarabæoides*, *Crotalaria verrucosa*, *Anisomeles ovata*, *Acalypha indica*, *Commelina bengalensis*, *Kyllinga triceps*, *Fimbristylis monostachya*, *Panicum prostratum* and *Setaria glauca*,—not a very extensive list, the chief interest of which lies in the fact that eight of these species have not been found as weeds in any of the existing clearings. Another possible member of the group is *Vernonia cinerea*, a common weed in existing clearings that may quite readily be a wind-borne species; still another is *Abrus precatorius*, which, however, having regard to its reputed qualities, is quite likely to have been deliberately introduced. Very nearly half the species in these old settlements must be looked on as having been introduced by man.

**Existing Settlements.**—In the extensive clearings that occupy much of the eastern Sundribuns, and in the line of constantly encroaching settlements along the northern border of the swamp-forests, the proportion of species introduced by man, whether purposely or by accident, is naturally very much higher than on abandoned sites. Another class of species well represented in such localities is that of plants introduced in all probability by water-birds: this is to be explained by the existence of many still-water ditches behind the embankments that have been thrown up to keep out the high tides, and by the presence of small ponds dug to provide drinking-water for the population. The number of species introduced by fruit-eating birds, on the other hand, is much smaller; this doubtless is to be explained by the absence of trees on which to rest, and the presence of inhabitants, rendering these clearings less inviting as resting places for birds of this kind than are the forests in their vicinity. Of the inanimate agencies, wind has been here the least effective; rivers, as might be expected, have been responsible for the introduction of not a few species that find the conditions in these clearings practically identical with those in the Bengal rice-plain whence they have been brought, and that therefore survive here when in the swamp-forests or at the sea-face they can find no foothold. Contrary to expectation, however, it is found that the agency of the sea is responsible for a very marked proportion of the species present in these clearings. This is to a considerable extent due to the survival of swamp-forest species along the banks of khals and on the sides of bunds, and to some extent owing to the fact that these clearings offer conditions suitable for plants growing at the sea-face that are incapable of subsisting in the swamp-forests. The littoral element in the vegetation of these clearings is not, however, to be explained entirely in this way; there are a number of species, very characteristic of sea-shores elsewhere in South-Eastern Asia, which one does not find in the Bengal plain outside the limits of these Sundribun clearings, but which one looks for equally in vain in the swamp-forests or at the sea-face.

Maritime species of this class are *Phaseolus adenanthus*, very plentiful on Andaman beaches; *Stictocardia tiliaefolia*, *Agyneia bacciformis*, *Blumea amplexans* var. *maritima*, *Sphæranthus africanus*, *Wedelia scandens*, *Pluchea indica* and *Suaeda maritima*—both occasionally met with in naturally clear spaces in the forests, *Azima*, *Psilotrichum*, *Solanum trilobatum*, *Cyperus scariosus*, *Fimbristylis polytrichoides* var. *halophila*, *Paspalum distichum*, *Scirpus triqueter* var. *segregata*. Other sea-borne species in open clearings are *Pycnus polystachyus* and *Zoysia*. Species introduced by the sea that survive along bunds and banks of khals in the clearings

are *Canavalia turgida*, *Vigna luteola*, *Derris uliginosa*, *Pongamia*, *Dalbergia spinosa*, *Cæsalpinia Nuga*, *Sonneratia apetala*, *Morinda*, *Ægialitis* and *Ægiceras*, the two *Sarcolobi*, *Acanthus ilicifolius*, *Clerodendron inerme*, *Premna integrifolia*, *Avicennia officinalis*, *Excoecaria*, *Flagellaria*, *Pandanus fascicularis*.

Species in clearings that have been introduced by rivers include *Tamarix gallica*, *Cæsalpinia Bonducella* probably, *Barringtonia acutangula*, *Conyza semipinnatifida*, *Wedelia calendulacea*—though this might equally well be an introduction by water-birds, *Ipomœa sepiaria*, *Lantana indica* and *L. trifolia*, *Lippia geminata* and *L. nudiflora*, *Trewia nudiflora*, *Casuarina equisetifolia*,\* two species of *Typha*, *Cryptocoryne*, *Cyperus exaltatus*, *Scirpus littoralis*, *Panicum repens*. Wind-introduced species in the clearings include *Vernonia cinerea* and *Ageratum conyzoides*, though both these might have been introduced as weeds with crops; *Grangea maderaspatana* and *Cnicus arvensis*, to which the same remark will apply; *Oxystelma esculentum*, *Dæmia extensa*, *Tylophora tenuis*, *Pentatropis microphylla*, *Imperata arundinacea*, *Chloris barbata*, *Asplenium esculentum*, *Nephrodium aridum*, *Polypodium proliferum*, *Acrostichum aureum*, *Helminthostachys zeylanica*.

Fruit-eating birds are possibly responsible for the introduction of *Passiflora suberosa*, *Cephalandra* and *Cucumis*, and almost certainly responsible for the presence of *Vitis trifolia*; they are also in all likelihood responsible for the dispersal in a wild state of *Basella*, but the influence of this agency is necessarily slight and cannot be associated with any other species. Water-birds, on the other hand, have to be credited with the introduction of all the fresh-water submerged or floating species enumerated in the previous chapter except *Ipomœa aquatica*, which is almost certainly a plant originally deliberately introduced. Besides these this agency probably explains the presence of *Hydrolea*, *Amnannia*, *Herpestis*, three *Hygrophilæ*, *Hemigraphis*, *Eleocharis*, one *Scirpus*, *Paspalum scrobiculatum*, *Eriochloa polystachya*, *Panicum Crus-galli* and, perhaps, *Diplachne fusca*.

Species intentionally introduced by man and still either under cultivation or existing as escapes have been already given in detail. The number of these species is not very great and the list is probably incomplete. The rest of the plants to be met with in clearings are weeds in all probability inadvertently introduced by man. The number of these weeds is by no means great, when the extent of the cleared area is considered, and hardly exceeds that of species

\* See remarks regarding this species in the systematic census.

whose presence is almost certainly due to the tides and ocean-currents. The subjoined table gives a synopsis of the facts detailed in the foregoing paragraphs.

*Table II.—Mode of introduction of Sundribun Plants.*

Species introduced by into	ANIMATE AGENTS.				INANIMATE AGENTS.		
	Man.		Birds.		Winds.	Rivers.	Tides.
	Inten- tionally	Inad- vertent- ly.	Aquatic.	Fragivo- rous			
Existing clearings . . .	23	56	29	4	15	19	36
Abandoned settlements . .	16	10	5	20	5	..	...
Grassy savannahs . . .	...	...	...	...	4	5	1
Swamp-Forests . . .	1	...	...	10	32	21	58
Sea-face fence . .	...	...	...	2	3	11	31
Total, eliminating overlapping of species in different areas .	36	58	30	23	50	41	96

The concluding portion of this enquiry into the origin of the Sundribun Flora involves a brief review of the distribution of the species in order to determine whence these have come into the region.

When those species that have possibly been originally introduced intentionally are considered, we find altogether 36 distributed as follows :—

Both westward and eastward from the Sundribuns . .	31
Cosmopolitan in the Tropics . . .	5
Tropics of Eastern Hemisphere, Australia, Poly- nesia . . .	2
Tropics of Eastern Hemisphere, Australia . .	4
Tropics of Eastern Hemisphere . . .	1
South-Eastern Asia, America ( <i>Parkinsonia</i> ) .	1
South-Eastern Asia, Australia . . .	3
South-Eastern Asia (India, Indo-China, Malaya) .	11
India, Indo-China . . .	4
Eastward only to Indo-China and Malaya ( <i>Bouea</i> ) . .	1

Westward only . . . . .	4
India, Africa ( <i>Acacia arabica</i> ) . . . . .	1
India only ( <i>Cyropsis</i> , <i>Egle</i> , <i>Ficus religiosa</i> ) . . . . .	3

With the solitary exception of *Bouea*, which is very rarely cultivated in Eastern Bengal, all of the species in the list are familiar plants in the Bengal Plain immediately to the north of the Sundribuns. This fact, taken in conjunction with the circumstance that for at least 10 per cent. of the species the introduction can only have been from the north, points to the conclusion that all the planted species, except perhaps *Bouea*, have been introduced from Bengal.

This conclusion is somewhat strengthened when the distribution of the introduced weeds is considered, for it may be safely assumed that inadvertently introduced species must in most cases have accompanied the deliberately introduced ones. The 58 weeds present we find to be distributed as follows:—

Both westward and eastward . . . . .	51
Cosmopolitan in the Tropics . . . . .	24
Tropics except Australia . . . . .	2
Tropics except Australia and Polynesia . . . . .	3
Tropics except Polynesia . . . . .	1
Tropics of Eastern Hemisphere, Australia, Polynesia . . . . .	1
Tropics of Eastern Hemisphere, Australia . . . . .	2
Tropics of Eastern Hemisphere, Polynesia . . . . .	1
Tropics of Eastern Hemisphere . . . . .	10
South-Eastern Asia, America . . . . .	1
South-Eastern Asia, Australia, Polynesia . . . . .	3
South-Eastern Asia, Australia . . . . .	1
India, Indo-China . . . . .	1
India, Chittagong . . . . .	1
Westward only . . . . .	7
America only . . . . .	3
America, Africa . . . . .	1
Africa, India . . . . .	1
Europe, India . . . . .	1
Europe only . . . . .	1

The weeds, as might be expected, are much more cosmopolitan than the cultivated species (about 50 per cent. in place of 12 per cent.) and the localised, purely South Eastern Asiatic weeds are fewer than the localised, purely South Eastern Asiatic planted species (about 4 per cent. in place of about 40 per cent.). In the case of the weeds there are no species distributed to the east but not to the west, while

as many as 12 per cent. are distributed to the westward of the Sundribuns only. Every thing therefore indicates that the species introduced by human agency have come from the north and west.

The species possibly introduced by water-birds are 30 in number, distributed as follows :—

Both westward and eastward . . . . .	27
Cosmopolitan in the Tropics . . . . .	10
Tropics of Eastern Hemisphere and Australia . . . . .	4
Tropics of Eastern Hemisphere . . . . .	1
South-Eastern Asia, Australia, America . . . . .	1
South-Eastern Asia, Australia . . . . .	3
South-Eastern Asia, Europe . . . . .	1
South-Eastern Asia . . . . .	3
Australia, Europe . . . . .	1
India, Indo-China . . . . .	3
Westward only . . . . .	3
India, Africa . . . . .	1
India . . . . .	2

The high percentage of cosmopolitan species brings plants of this group almost on a parallel with the introduced weeds. Here again none of the species are distributed to the eastward only; the species distributed to the westward only constitute 10 per cent. of the whole; it may therefore be concluded that these bird-introduced species, like the species introduced by man, are immigrants from the north.

When the 23 species, for which dispersal by fruit-eating birds is almost certain, are considered, we find a great contrast in their distribution since none of them are cosmopolitan, and more than half of them are confined to South-Eastern Asia (India, Indo-China, Malaya). The details are :—

Distributed both westward and eastward . . . . .	21
To Africa and throughout South-Eastern Asia . . . . .	3
Throughout South-Eastern Asia and to Australia . . . . .	5
Throughout South-Eastern Asia and to New Caledonia . . . . .	1
Throughout South-Eastern Asia . . . . .	8
Throughout India and Indo-China . . . . .	4
Distributed westward only ( <i>Loranthus langiflorus</i> ) . . . . .	1
Distributed eastward only; to Eastern Bengal north of the Sundribuns, and to Assam ( <i>Loranthus Scurrula</i> var.) . . . . .	1

If one may judge by the predominance of species that pass beyond South-Eastern Asia to Northern Australia and New Caledonia, over those that extend beyond South-Eastern Asia to Africa, we can

suppose that the pendulum-like bird-migrations which alternate with the monsoons throughout the submeridional ranges of hills and islands of Eastern Asia, are chiefly responsible for the introduction of such species into the Sundribuns. The figures, though too meagre to be conclusive, are not contrary to this deduction, which is in keeping with observed facts as regards the Andamans.

Passing now to the various inanimate agencies of dispersal, we have first to deal with species that are introduced by wind. Space forbids an examination in minute detail of the features of distribution of each of these plants, the requisite data for which are, however, given in the systematic census. It is sufficient here to say that they may be divided into four natural groups: (*a*) those with light spores (Vascular Cryptogams), of which the epiphytic forms either are cosmopolitan or are at least widely disseminated in the Old World and the terrestrial are at least widespread in South-Eastern Asia; (*b*) those with seeds or fruits of some size provided with a feathery pappus, a coma, or some equivalent arrangement,—again either cosmopolitan or, at least, widespread in South-Eastern Asia; (*c*) those with seeds provided with wings, of which we have but two examples, a *Dolichandrone* widely spread in South-Eastern Asia, and a *Dioscorea* that is found everywhere in the tropics of the Eastern Hemisphere; lastly, (*d*) those with very small and light seeds (Orchids) apparently exceedingly well adapted for dispersal by winds but nevertheless with often a remarkably localised distribution. The general features of the distribution of the 50 species of the class are :—

Distributed both westward and eastward . . . . .	35
Cosmopolitan in the Tropics . . . . .	6
Tropics of Eastern Hemisphere, Australia, Polynesia . . . . .	1
Tropics of Eastern Hemisphere, Australia . . . . .	3
Tropics of Eastern Hemisphere, Polynesia . . . . .	3
Tropics of Eastern Hemisphere . . . . .	3
South-Eastern Asia, Northern Australia, Polynesia . . . . .	1
South-Eastern Asia, Northern Australia . . . . .	2
South-Eastern Asia, Melanesia . . . . .	1
South-Eastern Asia . . . . .	11
India, Eastern Himalaya, Indo-China . . . . .	3
India (Circars), Tenasserim . . . . .	1
—	
Distributed eastward only . . . . .	
Indo-China, Malaya, Northern Australia . . . . .	1
Indo-China, Malaya . . . . .	1
Eastern Himalaya (Sikkim) and Indo-China . . . . .	6
Indo-China . . . . .	2
—	



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Distributed westward only (India and Ceylon) . . . . .	2
Undistributed ( <i>Oberonia Gammiei</i> , <i>Cirrhopetalum Roxburghii</i> , <i>Pteris vittata</i> ) . . . . .	3

The number of Indo-Chinese species that the Sundribuns share with Sikkim, which cannot, however, be regarded as a western region, is rather striking. It is not a little remarkable that three of the species not hitherto collected anywhere except in the Sundribuns should be species of a class eminently adapted for dispersal by means of an agency so constantly active in the area as wind.

The distribution of the 41 probably river-borne species does not call for detailed analysis, and the only remarks that have to be made regarding them turn on the question as to whether their presence in the Sundribuns is due to their having been brought down by the Ganges or the Brahmaputra. The topography of the region indicates that in most cases the Ganges is more likely to have been the agent, though with a number of the species either river may have been responsible, while there are a few species, such as *Micromelum pubescens*, *Teramnus flexilis*, *Eugenia fruticosa*, *Conyza semipinnatifida*, *Lippia geminata*, *Pandanus fœtidus*, *Dæmonorops Jenkinsianus*, *Cyperus inundatus*, that, having regard to their known distribution and in some cases also to their actual locality in the Sundribuns, we must believe to have been brought down by the Brahmaputra and not by the Ganges, if this means of dispersal be really responsible for their presence in our area. One species, moreover, for which the writer assumes tentatively this means of dispersal offers some difficulty. This is *Cryptocoryne ciliata*, a species very plentiful in Lower Bengal and one that is carried about in this particular manner, by upward-flowing tides: it is, however, fair to remark as well as by falling ones. The difficulty lies in the fact that this *Cryptocoryne* is confined to Lower Bengal, so far as India is concerned, and as it is also a Malayan species, the question arises whether it may not really be, as Mr. Clarke considers, a characteristic Sundribun plant, the presence of which in India is due to introduction by the sea. The objection to this conclusion is, after all, only that it does not appear to enter the Sundribun forests, or to establish itself in our area till clearings have been effected—a not insuperable objection when the case of species like *Blumea amplexans* var. *maritima*, *Paspalum distichum*, *Fimbristylis polytrichoides* var. *halophila*, *Solanum trilobatum*, *Azima tetracantha*, *Psilotrichum ferrugineum*, *Agyneia bacciformis* and *Sphæranthus africanus* are considered. The great difference between the *Cryptocoryne* and these other species lies in its submerged habit; it is easy to understand why the other species mentioned should find the conditions of the swamp-forests inimical to their welfare ;

there is no obvious reason why *Cryptocoryne* should decline to establish itself on the banks of muddy creeks before the forest disappears and yet do so profusely wherever a clearing has been effected.

The most interesting part of the enquiry into the distribution of the Sundribun species is that which concerns the sea-borne plants to be met with in the swamp-forests, at the sea-face and, to a less but still an appreciable extent, in the northern clearings. The subject has already been very fully and instructively dealt with by Mr. C. B. Clarke\* so that here only the briefest summary is necessary. It is sufficient to say that the results of an examination in detail of their distribution indicate that to a greater extent than even with the wind-borne element in the Flora, these species are of Malayan and not of Indian type. The distribution of the 96 species of this kind is summarised as follows :—

Distributed both westward and eastward . . . . .	63
Cosmopolitan on tropical coasts . . . . .	12
Coasts from America to Malaya . . . . .	1
Coasts from Eastern Africa to Polynesia . . . . .	4
Coasts from Eastern Africa to Northern Australia . . . . .	1
Coasts from Eastern Africa to Malaya . . . . .	6
Coasts from Eastern Africa to Malaya but not on those of India or Indo-China . . . . .	1
Coasts from Mascarenes to Polynesia . . . . .	3
Coasts from Mascarenes to Polynesia but not on those of India or Ceylon . . . . .	1
Coasts of Mascarenes, Coromandel and Java . . . . .	1
Coasts from Malabar to Polynesia . . . . .	6
Coasts from Malabar to Polynesia but not in Coromandel . . . . .	2
Coasts from Malabar to Australia . . . . .	2
Coasts from Malabar to Australia but not in Coromandel . . . . .	1
Coasts from Malabar to Malaya . . . . .	11
Coasts from Malabar to Malaya but not in Coromandel . . . . .	5
Coasts from Malabar to Indo-China . . . . .	1
Coasts from Malabar to Indo-China but not in Coromandel . . . . .	1
Coasts of Ceylon, Indo-China, Malaya, Australia . . . . .	1
Coasts of Ceylon, Malaya, Australia, Polynesia . . . . .	1
Coasts of Coromandel and Indo-China . . . . .	1
Coasts of Coromandel and China-Japan . . . . .	1
Distributed only eastward . . . . .	23
Coasts eastward to Polynesia . . . . .	2
Coasts eastward to Australia and New Guinea . . . . .	3

\* Proceedings, Linnean Society of London, 1894-95, pages 14-29

Coasts eastward to Southern China and Malaya . . . . .	8	
Coasts of Malaya only . . . . .	4	
Coasts to Tenasserim only . . . . .	6	
	<hr/>	
Distributed only westward . . . . .		7
Coromandel to Eastern Africa . . . . .	1	<hr/>
Coromandel to Eastern Africa but not in Malabar . . . . .	1	
Coromandel, Ceylon . . . . .	1	
Coromandel only . . . . .	1	
Ceylon only . . . . .	2	
Scinde only . . . . .	1	
Not reported from elsewhere than the Sundribuns ( <i>Hibiscus tortuosus</i> , <i>Carapa gangetica</i> , <i>Psilotrichum</i> <i>ferrugineum</i> .) . . . . .		3

The Flora to which nearly all except the seven species that are distributed only westward belong, is the Malayan 'Strand-Flora,' composed of littoral species that characterise every shore from Melanesia to the Mascarene Islands. Its natural area includes the shores of the various archipelagos from Vavau to Fiji, from New Caledonia to the Carolines; the shores of the Philippines, of northern Australia, of New Guinea and the other *quasi*-Malayan Islands that lie to the east of the Wallace line; of the Malayan Archipelago and Peninsula; of Ceylon; of Madagascar, Mauritius, the Comoro Islands, the Seychelles. At various points offshoots of this flora branch (*a*) into Polynesia, less marked perhaps than any; (*b*) from Ceylon north-westward along the coast of Malabar and the Concan, where the presence of this factor in the vegetation, though more marked than on Polynesian coasts, is not so strong as in other outlying portions of its domain; (*c*) to the east coast of Africa where the element is more strongly represented than in Malabar but is still not overwhelmingly strong; (*d*) northward along the shores of Cochin-China and Tonkin as far as the coasts of Southern China and Formosa, a few species even reaching Liu-kiu; and (*e*) strongest offshoot of all, northward along the coasts of Tenasserim and the Andamans to Arracan, Chittagong and, as our list shows, into the Sundribuns at the head of the Bay of Bengal, with the result that though certainly the most outlying part of its whole domain, this Sundribun area exhibits the features characteristic of the Flora in question on a scale and to a degree nowhere surpassed. The remarkable paucity of members of this flora on the Coromandel coast, which has nevertheless a distinctive littoral vegetation of its own, is well shown by our summary, since besides the 23 species that extend only eastward from the Sundribuns, 13 of those that extend also to Ceylon, Malabar, the Mascarenes or Africa are absent from Coromandel, as are 3 of those that are only of westward distribution; thus 42 out of

96 or  $\frac{7}{8}$  of the sea-borne plants of the Sundribuns are absent from the Coast of Coromandel. Nor is this quite all; of the littoral species found only in the northern clearings, three-fourths, and of the littoral species found only at the sea face, three-fifths are species that occur on the Coromandel Coast, while both the saltworts, which affect muddy slopes covered by every tide, are also Coromandel plants. The proportion of species that occur within the Sundribun forests proper but are not to be found on the Coast of Coromandel is thus appreciably increased and exceeds 50 per cent. of the characteristic Flora.

### V.—GUIDE TO THE GENERA.

An attempt is made in the following guide to the genera of plants that occur in the Sundribuns to provide a key sufficiently simple for use by Forest officers and their subordinates at most seasons of the year.

In using this key it is essential that in each case *both* the contrasting statements given for one of the numbers on the left-hand side of the page should be carefully read before deciding to which of the two categories a plant belongs. This done, the number printed in italics against the categorical statement on the right-hand side of the page carries the student to the proper passage. For example, a species is found to possess flowers; we pass to 2: it is not a grass or a sedge; we pass to 29: it is not a floating or submerged aquatic; we pass to 44: it is neither epiphytic nor parasitic; we pass to 59: it has no tendrils; we pass to 71: the leaves are not gland-dotted; we pass to 81: the leaves have distinct leaf-blades; we pass to 83: the leaves are compound; we go on with 84: they are opposite; we pass to 124: the leaflets are digitate; we know the plant to be a *Vitex*. Which *Vitex* it is we learn on turning to the 139th genus in the *Systematic List* where the differential characters of the species of this genus hitherto met with in the Sundribuns are given.

- |  |     |
|--|-----|
| 1. Plants with distinct flowers . . . . .  | 2   |
| Plants without flowers ( <i>Ferns</i> and <i>Fern-Allies</i> ) . . .   | 237 |
| 2. Plants with grassy stems; leaves with a distinct leaf-sheath,<br>sometimes only the sheath present; flowers in spikelets<br>in the axils of glumes ( <i>Sedges</i> and <i>Grasses</i> ) . . . | 3   |
| Plants with woody or herbaceous stems, or if the stems<br>grassy ( <i>Bulrushes</i> ) the flowers then not in spikelets .  | 29  |
| 3. Leaves 3-ranked, rarely without leaf-blades, the sheaths<br>closed in front; fruit a small nut with the seed free<br>inside; flowers with a glume only ( <i>Sedges</i> ) . . .                | 4   |

- Leaves 2-ranked, the sheaths open in front and with a ligule at the top behind; fruit a grain with seed adnate to pericarp; flowers between a glume and a palea (*Grasses*) . . . . . 12
4. Sedges with leaf-blades unarmed, sometimes absent; nuts minute and not 6-ribbed . . . . . 5
- Sedges with leaf-blades spiny on edges and mid-rib beneath; nuts large, black, hard, 6-ribbed 215. *Scirpodendron*.
5. Intermediate glumes of a spikelet containing hermaphrodite flowers usually numerous, always more than the 1-2 lowest empty glumes . . . . . 6
- Intermediate glumes of a spikelet containing hermaphrodite flowers always few, never more numerous than the 2 or more lowest empty glumes . . . . . 214. *Cladium*.
6. Flowering glumes 2-ranked . . . . . 7
- Flowering glumes arranged spirally . . . . . 10
7. Spikelets arranged in an open inflorescence . . . . . 8
- Spikelets densely clustered in a close head; rachilla of the spikelet deciduous . . . . . 207. *Kyllinga*.
8. Rachilla of the spikelet persistent . . . . . 9
- Rachilla of the spikelet deciduous . . . . . 210. *Mariscus*.
9. Fruit flattened laterally . . . . . 208. *Pycneus*.
- Fruit 3-cornered or flattened dorsally . . . . . 209. *Cyperus*.
10. (6) Base of style constricted or jointed above the fruit . . . . . 11
- Base of style continued into the fruit . . . . . 213. *Scirpus*.
11. Stem leafy below . . . . . 212 *Fimbristylis*.
- Stem leafless . . . . . 211. *Eleocharis*.
12. (3) Stamens 6 . . . . . 13
- Stamens not more than 3 . . . . . 14
13. Glumes firm and chartaceous . . . . . 221. *Oryza*.
- Glumes thin and membranous . . . . . 222. *Leersia*.
14. (12) Spikelets deciduous from their pedicels or falling with them; perfect spikelets with 2 heteromorphous florets, the upper hermaphrodite, the lower male or neuter . . . . . 15
- Spikelets continuous with their pedicels and breaking off so as to leave the persistent or subsistent glumes on the pedicel, or if falling entire not composed of 2 heteromorphous florets . . . . . 23
15. Rachis not continued beyond terminal spikelet . . . . . 16
- Rachis continued beyond the terminal spikelet

16. Spikelets in continuous spikes, racemes or panicles; outer glumes not firmer than flowering glumes, the lowest smallest sometimes very small or obsolete . . . . . 17  
 Spikelets in pairs, one sessile, the other pedicelled, or the terminal 3-nate or solitary; outer glumes firmer than the flowering glumes, the lowest longer than the florets 21
17. Spikelets not subtended by a whorl of bristles . . . . . 18  
 Spikelets subtended by a whorl of bristles . . . . . 219. *Setaria*.
18. Spikelets 2-flowered, the upper hermaphrodite, the lower male or barren, separating from their pedicels . . . . . 19  
 Spikelets 1-flowered, deciduous with the pedicels 223. *Zoysia*.
19. Lowest glume obsolete, *i.e.*, only 3 glumes present . . . . . 20  
 Lowest glume present, *i.e.*, glumes 4 . . . . . 218. *Panicum*.
20. Spikelets not thickened at the base . . . . . 216 *Paspalum*.  
 Spikelets thickened at base . . . . . 217. *Eriochloa*.
21. (16) Spikelets similar . . . . . 22  
 Spikelets dissimilar . . . . . 226. *Andropogon*.
22. Stamens 3 . . . . . 225. *Saccharum*.  
 Stamens 2 . . . . . 224. *Imperata*.
23. (14) Spikelets panicle or if spicate not secund . . . . . 24  
 Spikelets 2-seriate and secund . . . . . 27
24. Spikelets 2-more-flowered . . . . . 25  
 Spikelets 1-flowered . . . . . 227. *Sporobolus*.
25. Spikelets without silky hairs . . . . . 26  
 Spikelets with glabrous glumes, but penicillate with long silky hairs on the rachilla . . . . . 230. *Phragmites*.
26. Outer glume shorter than the lowest flowering glume; grain minute . . . . . 231. *Eragrostis*.  
 Outer glume longer than the lowest flowering glume; grain broad . . . . . 232. *Myriostachya*.
27. (23) Spikelets digitate or whorled . . . . . 28  
 Spikelets on the long, slender, spiciform branches of an elongated simple panicle . . . . . 233. *Diplachne*.
28. Spikelets 1-flowered . . . . . 228. *Chloris*.  
 Spikelets more than 1-flowered . . . . . 229. *Eleusine*.
29. (2) Aquatic plants, floating or submerged . . . . . 30  
 Land plants or, if growing in water, not submerged under normal conditions; leaves and stems not floating . . . . . 44
30. Leaves and stems floating, with roots from base or nodes suspended in the water . . . . . 31  
 Leaves and stems submerged; roots attached to soil . . . . . 34

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31. Stems more or less elongated, with leaves and roots at nodes separated by distinct internodes . . . . . 32  
 Stems very short, with a rosette of clustered leaves above and a tuft of roots below . . . . . 204. *Pistia*.
32. Leaves alternate . . . . . 33  
 Leaves whorled; small plants with articulate stems and almost transparent leaves . . . . . 61. *Aldrovanda*.
33. Flowers small, white . . . . . 116. *Limnanthemum*.  
 Flowers rather large, purplish . . . . . 123. *Ipomœa*.
34. (30) Plants submerged only at high-tides . . . . . 35  
 Plants in still water, always submerged . . . . . 37
35. Shrubs or herbs with leafless, fleshy, jointed stems; flowers not in spathes . . . . . 36  
 Herbs with buried rootstock and tufted linear-lanceolate leaves; flowers on a spadix enclosed in a tubular spathe septate within . . . . . 203. *Cryptocoryne*.
36. Flowers in sessile cone-like spikes . . . . . 149. *Arthrocnemum*.  
 Flowers sunk in cavities in joints of stem . . . . . 148. *Sulicornia*.
37. (34) Flowers at or above the surface of the water . . . . . 38  
 Flowers as well as leaves submerged . . . . . 42
38. Flowers white, solitary on a scape . . . . . 39  
 Flowers yellow, in racemes rising above the surface of the water . . . . . 131. *Utricularia*.
39. Stemless plants; leaves all radical . . . . . 40  
 Stem leafy throughout . . . . . 41
40. Perianth single; fruit on a slender spiral scape, not winged; male spathes disarticulating . . . . . 177. *Vallisneria*.  
 Perianth double; fruit on a stoutish scape, winged . . . . . 178. *Ottelia*.
41. (39) Leaves whorled . . . . . 175. *Hydrilla*.  
 Leaves alternate . . . . . 176. *Lagarosiphon*.
42. (37) Stamens 1-2; leaves linear . . . . . 43  
 Stamens numerous; leaves cut into many filiform, toothed lobes . . . . . 174. *Ceratophyllum*.
43. Leaves entire; stamens 2 . . . . . 205. *Ruppia*.  
 Leaves toothed; stamen 1 . . . . . 206. *Naias*.
44. (29) Plants growing epiphytically or parasitically on the stems or branches of other species . . . . . 45  
 Plants rooted in the ground . . . . . 59
45. Leafless twining parasites with long slender stems . . . . . 46  
 Leafy not twining partial parasites or epiphytes . . . . . 47
46. Stems and flowers green; stamens 9 . . . . . 153. *Cassytha*.  
 Stems yellowish, flowers white; stamens 5 . . . . . 124. *Cuscuta*.

47. (45) Leaves opposite ; flowers regular or nearly so . . . 48  
 Leaves alternate or leaf solitary ; flowers irregular  
 (*Orchids*) . . . . . 51
48. Juices milky ; non-parasitic . . . . . 49  
 Juices watery ; parasitic . . . . . 50
49. Corolla medium, rotate ; flowers in stalked umbels 114. *Hoya*.  
 Corolla, small, urceolate ; flowers in axillary fascicles  
 113. *Dischidia*.
50. (48) Leaves usually broad, penninerved ; flowers herma-  
 phrodite . . . . . 154. *Loranthus*.  
 Leaves rather narrow, 3-nerved from the base ; flowers  
 1-sexual . . . . . 155. *Viscum*.
51. (47) Leaf solitary at apex of a rounded pseudobulb . . . 52  
 Leaves more than one, on a usually elongated stem . . . 53
52. Flowers in umbels ; lateral sepals under the lip, longer than  
 the dorsal . . . . . 181. *Cirrhopetalum*.  
 Flowers solitary ; sepals all equal, spreading . . . 182. *Trias*.
53. (51) Leaves terete . . . . . 54  
 Leaves flattened or compressed . . . . . 55
54. Lip not spurred . . . . . 183. *Luisia*.  
 Lip spurred . . . . . 185. *Sarcanthus*.
55. (53) Leaves flattened with an upper and a lower surface or,  
 if laterally compressed and equitant, with sheath about  
 as long as blade and flowers axillary . . . . . 56  
 Leaves compressed, equitant, sheath shorter than blade ;  
 and flowers many, minute, in a narrow raceme 179. *Oberonia*.
56. Stems not tufted, roots few, large, issuing at intervals  
 from side of stem, leaves flat or channeled, coriaceous ;  
 lip spurred . . . . . 57  
 Stems tufted ; roots many, clustered at base ; leaves flat,  
 thin ; or short, equitant, and fleshy ; lip with only a short  
 mentum . . . . . 180. *Dendrobium*.
57. Spur of the lip partially occluded . . . . . 58  
 Spur of the lip with neither occluding calli nor a  
 septum within . . . . . 184. *Saccolabium*.
58. Spur occluded by calli but with no septum 186. *Cleisostoma*.  
 Spur partially occluded by calli and with besides a vertical  
 antero-perterior septum dividing it into two lateral  
 chambers . . . . . 185. *Sarcanthus*.
59. (44) Plants climbing by means of tendrils . . . . . 60  
 Plants without tendrils . . . . . 71
60. Tendrils forming part of a leaf . . . . . 61  
 Tendrils not forming part of a leaf . . . . . 63



61. Leaves compound; tendrils a continuation of main rachis 62  
 Leaves simple, the tendrils the spirally curled tips of the  
 leaf-blades . . . . . 194. *Flagellaria*.
62. Leaves once divided, leaflets 2; fruits in clusters of  
 feathery achenes . . . . . 1. *Naravelia*  
 Leaves twice compound, leaflets several; fruits of very  
 large pods . . . . . 59. *Entada*.
63. (60) Leaves simple or only once divided; fruit indehiscent  
 or opening by a stopple . . . . . 64  
 Leaves twice 3-nately compound; fruit a bladder-like  
 3-celled capsule . . . . . 31. *Cardiospermum*.
64. Flowers with no corona between petals and the stamens . 65  
 Flowers with a distinct corona interposed between petals  
 and stamens . . . . . 73. *Passiflora*.
65. Stamens and pistil in different flowers . . . . . 66  
 Stamens and pistils in the same flower; leaves simple or  
 once divided . . . . . 29. *Vitis*.
66. Tendrils branched . . . . . 67  
 Tendrils simple . . . . . 68
67. Petals with margins entire . . . . . 75. *Luffa*.  
 Petals with margins fimbriately divided . 74. *Trichosanthes*.
68. (66) Corolla divided nearly to base into 5 equal petals . ' 69  
 Corolla campanulate with lobes only divided about half-  
 way down . . . . . 78. *Cephalandra*.
69. Anther-cells folded sigmoidly . . . . . 70  
 Anther-cells straight or, if curved, not sigmoid 79. *Zehneria*.
70. Staminate flowers racemed . . . . . 76. *Momordica*.  
 Staminate flowers clustered or solitary . . 77. *Cucumis*.
71. (59) Leaves dotted with embedded glands . . . . . 72  
 Leaves not dotted with embedded glands . . . . . 81
72. Leaves alternate; trees or shrubs . . . . . 73  
 Leaves opposite, simple . . . . . 77
73. Leaves simple . . . . . 74  
 Leaves compound . . . . . 75
74. Stem unarmed; fruit a narrow, curved capsule 99. *Ægiceras*.  
 Stem spinous, scandent; fruit globose, umbonate, indehis-  
 cent . . . . . 22. *Paramignya*.
75. (73) Leaflets alternate; stamens 10 or fewer . . . . . 76  
 Leaflets an opposite pair with one terminal; stamens  
 30 or more . . . . . 23. *Ægle*.
76. Leaflets 3-5 . . . . . 20. *Glycosmis*.  
 Leaflets 9-15 . . . . . 21. *Micromelum*.

77. (72) Herbs ; corolla gamopetalous . . . . . 78  
 Trees ; petals free . . . . . 67. *Eugenia*.
78. Fruit of 4 small nutlets with a single seed in each . . . . . 79  
 Fruit a 2-celled many-seeded capsule . . . . . 127. *Limnophila*.
79. Calyx with upper tooth not exceeding the others ; stamens  
 ascending under the upper lip . . . . . 80  
 Calyx with upper tooth decurrent, much exceeding the  
 others ; stamens declinate . . . . . 142. *Ocimum*.
80. Upper lip of corolla flat . . . . . 143. *Anisomeles*.  
 Upper lip of corolla vaulted, densely villous on back 144. *Leucas*.
81. (71) Leaves very minute and scale-like . . . . . 82  
 Leaves with a quite distinct leaf-blade . . . . . 83
82. Tall trees ; branches, green, cylindric, jointed ; nodes with  
 sheaths of connate subulate scales . . . . . 173 *Casuarina*.  
 Small trees with many close-set but not connate, alternate  
 imbricating scale-like leaves . . . . . 10. *Tamarix*.
83. (81) Leaves compound . . . . . 84  
 Leaves simple . . . . . 125
84. Leaves alternate . . . . . 85  
 Leaves opposite . . . . . 124
85. Leaves digitate . . . . . 86  
 Leaves pinnate . . . . . 92
86. Stems not climbing or twining . . . . . 87  
 Stems twining ; leaf axils bulbiferous . . . . . 190. *Dioscorea*.
87. Leaflets 3 only . . . . . 88  
 Leaflets more than 3 . . . . . 91
88. Shrubs or herbs . . . . . 89  
 Trees . . . . . 6. *Cratæva*.
89. Stems erect . . . . . 90  
 Stems prostrate . . . . . 19. *Oxalis*.
90. Leaflets without resinous glands below . . . . . 36. *Crotalaria*.  
 Leaflets with resinous glands below . . . . . 48. *Flemingia*.
91. (87) Flowers yellow . . . . . 4. *Cleome*.  
 Flowers purplish to white . . . . . 5. *Gynandropsis*.
92. (85) Leaflets 3 only . . . . . 93  
 Leaflets more than 3 . . . . . 102
93. Stems erect . . . . . 94  
 Stems prostrate or climbing . . . . . 97
94. Stems woody . . . . . 95  
 Stems herbaceous ; hairs fixed by their centres 37. *Cyamopsis*.
95. Stem unarmed . . . . . 96  
 Stem armed with conical prickles . . . . . 43. *Erythrina*.

96. Fruit fleshy, 1-2-lobed; leaflets toothed . . . 32. *Allophylus*.  
Fruit a lomentum, breaking up into indehiscent joints;  
leaflets entire . . . . . 39. *Desmodium*.
97. (93) Stems herbaceous; pods without stinging  
hairs . . . . . 98  
Stems woody; pods with stinging hairs . . . 42. *Mucuna*.
98. Leaves not glandular beneath . . . . . 99  
Leaves with superficial resinous glands among the hairs  
beneath . . . . . 47. *Atylosia*.
99. Stamens monadelphous . . . . . 100  
Stamens diadelphous . . . . . 101
100. Flowers small; pods thin, narrow; alternate stamens  
abortive . . . . . 41. *Teramnus*.  
Flowers large; pods thick, wide; all the stamens with  
perfect anthers . . . . . 44. *Canavalia*.
101. (99) Keel spirally twisted . . . . . 45. *Phaseolus*.  
Keel obtuse, not spirally twisted . . . . . 46. *Vigna*.
102. (92) Leaves unequally pinnate . . . . . 103  
Leaves even-pinnate . . . . . 114
103. Flowers on spadices covered by spathes; woody stems with  
the vascular bundles isolated and scattered (*Palms*) . . 104  
Flowers not on spadices; woody stems with vascular  
bundles in concentric rings . . . . . 109
104. Stems erect, or stem very short and leaves tufted . . . 105  
Stems scandent with the aid of retrorse hooks . . . 108
105. Leaflets with reduplicate sides . . . . . 106  
Leaflets induplicate; stems long, slender . . . 197. *Phœnix*.
106. Stems elongated, with a terminal tuft of leaves . . . 107  
Stems very short, with a tuft of very large leaves close to  
the ground . . . . . 195. *Nipa*.
107. Stems straight, slender; fruits numerous, never more than  
2 in. long . . . . . 196. *Areca*.  
Stems rather crooked, stout; fruits fewer, always more than  
8 in. long . . . . . 200. *Cocos*.
108. (104) Spathe tubular, persistent . . . . . 198. *Calamus*.  
Spathe cymbiform, deciduous . . . . . 199. *Dæmonorops*.
109. (103) Leaflets opposite . . . . . 110  
Leaflets alternate . . . . . 49. *Dalbergia*.
110. Leaflets once pinnate . . . . . 111  
Leaflets more than once pinnate . . . . . 30. *Leea*.
111. Erect trees . . . . . 112  
Climbing shrubs . . . . . 51. *Derris*.

112. Roots without root-suckers ; fruit indehiscent . . . . . 113  
 Roots with vertical blind root-suckers ; fruit a subglobose,  
 2-3-celled capsule . . . . . 24. *Amoora*.
113. Fruit a small compressed drupe with a hard stone ; leaves  
 few, at ends of branches . . . . . 35. *Odina*.  
 Fruit a coriaceous, indehiscent 1-seeded pod ; leaves scat-  
 tered, many . . . . . 50. *Pongamia*.
114. (10 ) Leaves once pinnate ; unarmed species . . . . . 115  
 Leaves more than once pinnate ; species armed with spines  
 or thorns or prickles . . . . . 121
115. Stems erect . . . . . 116  
 Stems twining . . . . . 40. *Abrus*.
116. Fruit a pod, dehiscent or indehiscent . . . . . 117  
 Fruit a large, globose, 4-valved capsule . . . . . 25. *Carapa*.
117. Petals 5 . . . . . 118  
 Petals fewer than 5 . . . . . 120
118. Stamens free ; petals equal, the upper inmost . . . . . 119  
 Stamens united nine below in a sheath, one upper free ;  
 petals unequal, irregular, the upper the outmost 38. *Sesbania*.
119. Anthers large, often unequal, only seven perfect, opening  
 by apical pores . . . . . 55. *Cassia*.  
 Anthers small, opening by lateral slits . . . . . 56. *Cynometra*.
120. (117) Petals 3 ; stamens 3, filaments short, united ; pod  
 pulpy indehiscent . . . . . 57. *Tamarindus*.  
 Petal solitary ; stamens 3, filaments long, free ; pod dry,  
 dehiscent . . . . . 58. *Intsia*.
121. (114) Flowers medium, in racemes or panicles ; petals free ;  
 stamens 10 . . . . . 122  
 Flowers minute, in globose heads ; petals united below ;  
 stamens more than 10 . . . . . 60. *Acacia*.
122. Pod flattened or swollen, but not beaded opposite the seeds ;  
 calyx with a larger cymbiform lowest lobe . . . . . 123  
 Pod turgid, beaded opposite the seeds ; calyx lobes all  
 subequal . . . . . 54. *Parkinsonia*.
123. Pod broadly winged down upper suture . . . . . 53. *Mezoneuron*.  
 Pod not winged . . . . . 52. *Cæsalpinia*.
124. (84) Leaves digitate . . . . . 139. *Vitex*.  
 Leaves pinnate . . . . . 132. *Dolichandrone*.
125. (83) Flowers minute, in heads surrounded by a whorl of  
 bracts . . . . . 126  
 Flowers rarely in heads, and if so not surrounded by a  
 whorl of bracts . . . . . 136

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126. Leaves alternate . . . . . 127  
 Leaves opposite . . . . . 135
127. Plants armed with sharp spines . . . . . 128  
 Plants unarmed . . . . . 129
128. Spines forked, scattered along stem; margins of leaves not  
 spiny . . . . . 94. *Xanthium*  
 Spines simple, on margins of the leaves . . . . . 96. *Cnicus*
129. (127) Juice not milky . . . . . 130  
 Juice milky . . . . . 97. *Launea*.
130. Herbs . . . . . 131  
 Shrubs or under-shrubs . . . . . 92. *Pluchea*.
131. Florets yellow . . . . . 132.  
 Florets purple . . . . . 87. *Vernonia*.
132. Stems not winged . . . . . 133.  
 Stems winged . . . . . 93. *Sphaeranthus*.
133. Anther-cells without tails . . . . . 134  
 Anther-cells tailed . . . . . 91. *Blumea*.
134. Outer florets of head (ray) differing from central florets;  
 stem erect . . . . . 90. *Conyza*.  
 Outer florets like central; stem prostrate . . . . . 89. *Grangea*.
135. (126) Florets yellow . . . . . 95. *Wedelia*.  
 Florets purple . . . . . 88. *Ageratum*.
136. (125) Leaves alternate or radical only . . . . . 137  
 Leaves opposite . . . . . 193
137. Plants with milky juice; trees . . . . . 138  
 Plants with watery juice; if bitter or resinous, not milky . . . . . 142
138. Flowers visible . . . . . 139  
 Flowers minute, hidden within a hollow, closed, fleshy  
 receptacle . . . . . 172. *Ficus*.
139. Flowers small or minute, incomplete; perianth green . . . . . 140  
 Flowers large; corolla white . . . . . 102. *Cerbera*.
140. Leaves smooth; juice acrid; fruit a 3-celled capsule . . . . . 141  
 Leaves scabrid, juice bland; fruit covered by the persistent  
 calyx, membranous, 1-seeded . . . . . 173. *Streblus*.
141. Racemes terminal; leaves toothed . . . . . 168. *Sapium*.  
 Racemes axillary; leaves entire . . . . . 169. *Excœcaria*.
142. (137) Leaves with a convolute leaf-sheath . . . . . 143  
 Leaves with no distinct leaf-sheath . . . . . 151
143. Stems erect, woody; shrubs or small trees . . . . . 144  
 Stems herbaceous, or stem none; leaves radical . . . . . 145
144. Leaves with orbicular blades distinct from leaf-sheaths;  
 not prickly . . . . . 98. *Ægialitis*.

- Leaves with linear blades passing into the leaf-sheaths;  
armed with prickles along the margins and the midrib  
beneath . . . . . 201. *Pandanus*.
145. (143) Leaf-blades flattened . . . . . 146  
Leaf-blades linear, spongy or fistular, semi-cylindric or  
triquetrous; all radical . . . . . 150.
146. Stems above ground herbaceous, decumbent, rooting . 147  
Stems underground or none, or if above ground erect . 148
147. Cymes included in a large bract . . . 192. *Commelina*.  
Cymes naked, paniculate . . . . 193. *Aneilema*.
148. (146) Leaves on an erect pseudo-stem formed of clasping  
leaf-sheaths . . . . . 149  
Leaves radical; flowers large, umbellate . 189. *Crinum*.
149. Flowers in a panicle at the apex of the leafy  
pseudo-stem . . . . . 188. *Alpinia*.  
Flowers in a spike rising direct from root-stock, separate  
from the leafy pseudo-stem . . . . 187. *Zingiber*.
150. (145) Flowers distinct, white, racemose; scape slender;  
field-weeds . . . . . 191. *Asphodelus*.  
Flowers minute, close-set on a cylindric spike; large  
aquatic plants (*Bulrushes*) growing on edges of ponds  
and streams . . . . . 202. *Typha*.
151. (142) Petals or perianth-segments united in a gamo-  
petalous corolla . . . . . 152  
Petals never united, often not present . . . . 161
152. Corolla regular, its base surrounded by a calyx . . 153  
Corolla (perianth) irregular; calyx absent . 152. *Aristolochia*.
153. Erect trees . . . . . 154  
Herbs or climbing under-shrubs or shrubs . . . 155.
154. Stamens 5 or 6 . . . . . 118. *Cordia*.  
Stamens 16 or more . . . . . 106. *Diospyros*.
155. (153) Stems prostrate or, if twining, unarmed . . 156  
Stems erect or, if climbing, prickly . . . . 159
156. Flowers large, stalked, pink to purple; stems twining  
or if prostrate the leaves not lying flat on the ground and  
not crispate . . . . . 157  
Flowers small, sessile, white; stems and crispate leaves  
both close to ground . . . . . 119. *Coldenia*.
157. Sepals coriaceous but not so enlarged in fruit as to hide  
the capsule . . . . . 158  
Sepals fleshy and mucilaginous in fruit, quite concealing the  
capsule . . . . . 121. *Stictocardia*.

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158. Pollen spinulose . . . . . 123. *Ipomœa*.  
 Pollen not spinulose . . . . . 122. *Merremia*.
159. (155) Inflorescence of lax racemes, cymes, or umbels . 160  
 Inflorescence of dense spikes . . . 120. *Heliotropium*.
160. Fruit a capsule . . . . . 117. *Hydrolea*.  
 Fruit a berry . . . . . 125. *Solanum*.
161. (151) Plants prickly or spiny or thorny . . . . . 162  
 Plants unarmed . . . . . 165
162. Sarmentose or semi-erect; armed with thorns or prickles 163  
 Erect; armed with rigid spines . . . 8. *Flacourtia*.
163. Fruit sessile above the calyx; stamens not more numerous  
 than petals . . . . . 164  
 Fruit stipitate on a carpophore; stamens more numerous  
 than petals; thorns of modified stipules . 7. *Capparis*.
164. Leaves glabrous; plant armed with few prickles . 26. *Ola*.  
 Leaves more or less hairy; plant armed with numerous  
 stipular thorns . . . . . 28. *Zizyphus*.
165. (161) Stems sarmentose or twining . . . . . 166  
 Stems erect . . . . . 170
166. Flowers small or very small, greenish . . . . . 167  
 Flowers large, showy, yellow . . . . . 13. *Hibiscus*.
167. Stems woody, rather stout; flowers all 1-sexual . . . 168  
 Stems herbaceous . . . . . 169
168. Stamens numerous; fruit a capsule . . . . . 167. *Mallotus*.  
 Stamens 5; fruit a small drupe . . . . . 157. *Bridelia*.
169. (167) Flowers 1-sexual; stamens 6; carpels 3, free; seeds  
 curved . . . . . 2. *Tinospora*.  
 Flowers 2-sexual; stamens 5; ovary 1-celled . 151. *Basella*.
170. (165) Trees or large woody shrubs . . . . . 171  
 Herbs or small under-shrubs . . . . . 182
171. Leaves with margins quite entire . . . . . 172  
 Leaves with margins toothed . . . . . 180
172. Leaves subcordate, palminerved at the base . . . . . 173  
 Leaves oblong to lanceolate, penninerved . . . . . 174
173. Flowers large, showy, yellow . . . . . 14. *Thespesia*.  
 Flowers medium, rose-coloured . . . . . 16. *Kleinhovia*.
174. (172) Fruit not crowned by the calyx . . . . . 175  
 Fruit crowned by the remains of the calyx . 66. *Lumnitzera*.
175. Leaves with silvery scales beneath; ripe carpels free . 176  
 Leaves glabrous or hairy but not scaly beneath; ripe car-  
 pels united . . . . . 177
176. Petals 5 . . . . . 17. *Brownlowia*.  
 Petals 0 . . . . . 15. *Heritiera*.

177. (175) Leaves glabrous beneath . . . . . 178  
 Leaves tomentose beneath . . . . . 162. *Antidesma*.
178. Petals 0 . . . . . 179  
 Petals 5, each with a basal scale . . . . . 33. *Aphania*.
179. Stamens 3, united in a central column . . . . . 160. *Breynia*.  
 Stamens 6 or more, free . . . . . 161. *Cyclostemon*.
180. (171) Flowers small, 1-sexual; fruit not crowned by the  
 remains of the calyx . . . . . 181  
 Flowers large, 2-sexual; fruit large, indehiscent with the  
 calyx-lobes persistent on its apex . . . . . 69. *Barringtonia*.
181. Stamens 10-12; sepals clothed with flat scales; fruit a 3-  
 celled capsule . . . . . 163. *Croton*.  
 Stamens 3-5; sepals hairy but without scales; fruit minute,  
 1-seeded . . . . . 170. *Trema*.
182. (170) Petals 0 or, if present, similar in size and shape . . . . . 183  
 Petals large, dissimilar and very irregular, the uppermost  
 outmost . . . . . 36. *Crotalaria*.
183. Stamens united . . . . . 184  
 Stamens free . . . . . 188
184. Flowers conspicuous; petals yellow; stamens many, in a  
 tube round the style; flowers 2-sexual . . . . . 185  
 Flowers very small, green, 1-sexual; petals 0 . . . . . 186
185. Styles as many as the carpels . . . . . 11. *Abutilon*.  
 Styles twice as many as the carpels . . . . . 12. *Malachra*.
186. (184) Stamens 3 only, united in a central column . . . . . 187  
 Stamens 5-15, united in whorls . . . . . 164. *Chrosophora*.
187. Sepals of male flowers with white margins . . . . . 158. *Agyneia*.  
 Sepals green . . . . . 159. *Phyllanthus*.
188. (183) Flowers yellow . . . . . 189  
 Flowers white or green, very small . . . . . 190
189. Stamens 10 or more; flowers small . . . . . 18. *Corchorus*.  
 Stamens 5; flowers large . . . . . 72. *Turnera*.
190. (188) Leaves entire or toothed, not lobed; petals 0 . . . . . 191  
 Leaves deeply pinnatifidly divided; sepals 4; petals 4;  
 stamens 6 . . . . . 3. *Senebiera*.
191. Leaves broad, membranous . . . . . 192  
 Leaves narrow, fleshy; sepals 5; stamens 5 . . . . . 150. *Suaeda*.
192. Stamens 5 or fewer; leaves not toothed; sepals scarious;  
 fruit 1-celled . . . . . 145. *Amarantus*.  
 Stamens 8 or more; leaves toothed; sepals herbaceous,  
 united; fruit 3-celled . . . . . 165. *Acalypha*.
193. (136) Juices milky . . . . . 194  
 Juices not milky . . . . . 204



194. Stipules wanting ; fruit 2-follicular . . . . . 195  
     Stipules present, minute ; fruit 3-celled . . . . . 156. *Euphorbia*.
195. Stems twining . . . . . 196  
     Stems erect . . . . . 107. *Calotropis*.
196. Seeds with a pencil of hairs (coma) . . . . . 197  
     Seeds without hairs . . . . . 110. *Sarcolobus*.
197. Corolla with a corona in the throat . . . . . 198  
     Corolla throat naked . . . . . 103. *Parsonsia*
198. Filaments of stamens united . . . . . 199  
     Filaments free . . . . . 203
199. Corona single, staminal only . . . . . 200  
     Corona double, corolline and staminal . . . . . 106. *Oxystelma*.
200. Corolla rotate . . . . . 201  
     Corolla funnel-shaped . . . . . 109. *Dæmia*
201. Pollen masses erect, or at least with erect pedicels . . . . . 202  
     Pollen-masses wholly pendulous . . . . . 108. *Pentatropis*.
202. Flowers green, fairly large ; pollen-masses quite erect ;  
     follicles stout . . . . . 111. *Dregea*.  
     Flowers white, minute ; pollen-masses with only the pedi-  
     cels erect ; follicles slender . . . . . 112. *Tylophora*.
203. (198) Scales of corona short, thick . . . . . 104. *Hemidesmus*.  
     Scales of the corona filiform . . . . . 105. *Finlaysonia*.
204. (193) Leaves with stipules or interpetiolar nodal appen-  
     dages or stipular lines . . . . . 205  
     Leaves without stipules or interpetiolar lines . . . . . 215
205. Trees or large woody shrubs . . . . . 206  
     Herbs with prostrate stems and branches . . . . . 214
206. Flowers 2-sexual ; corolla always present . . . . . 207  
     Flowers dioecious ; petals 0 ; leaves palmicnerved . . . . . 166. *Trewia*.
207. Petals distinct ; embryo germinating before fruit falls  
     (*Mangroves*) . . . . . 208  
     Petals united in a regular tubular corolla . . . . . 211
208. Petals more than 4 ; stamens more than 8 . . . . . 209  
     Petals 4, entire ; stamens 8 . . . . . 62. *Rhizophora*.
209. Calyx-segments and petals 5-6 . . . . . 210  
     Calyx-segments and petals 8-14 ; stamens 16-28 . . . . . 65. *Bruguiera*.
210. Petals emarginate ; stamens 10-12 ; ovary 3-celled . . . . . 63. *Cerlops*.  
     Petals lacerate ; stamens over 12 ; ovary 1-celled . . . . . 64. *Kandelia*.
211. (207) Branches unarmed . . . . . 212  
     Branches armed with axillary spines . . . . . 84. *Vangueria*.
212. Flowers quite free . . . . . 213  
     Flowers with the calyx-tubes agglutinated to form large  
     globular heads . . . . . 86. *Morinda*.

213. Flowers small, in axillary spikes . . . . 83. *Petunga*.  
 Flowers long-tubed, in terminal cymes . . . . 85. *Ixora*.
214. (205) Flowers white; corolla tubular; stamens 4-5; stipules  
 connate; leaves herbaceous . . . . 82. *Oldenlandia*.  
 Flowers yellow; petals free; stamens 8 or more; stipules  
 represented by scarious nodal appendages; leaves and  
 stems fleshy, succulent . . . . 9. *Portulaca*.
- 215 (204) Roots with blind vertical root-suckers . . . . 216  
 Roots without blind root-suckers . . . . 217
216. Flowers large; stamens very many, rising from calyx;  
 petals free or absent . . . . 71. *Sonneratia*.  
 Flowers small, yellow; stamens 4, adnate to corolla; petals  
 connate . . . . 141. *Avicennia*.
217. (215) Petals united in an irregular corolla . . . . 218  
 Petals absent or, if present, free . . . . 229
218. Stamens 4 perfect . . . . 219  
 Stamens 1 only perfect, 3 barren; very small herbs in  
 waste-places and fields . . . . 115. *Hoppea*.
219. Fruit a 2-celled capsule with more than one seed in each  
 of the cells . . . . 220  
 Fruit with 4 or more 1-seeded cells, rarely a capsule . . 226
220. Stamens didynamous, one pair longer than the other . . 221  
 Stamens nearly equal in length; flowers very small, white;  
 seeds many . . . . 130. *Scoparia*.
221. Seeds hard, on rigid curved stalks (retinacula) . . . . 222  
 Seeds without retinacula . . . . 224
222. Seeds more than 2 in each cell; corolla with an upper  
 lip or posterior lobes . . . . 223  
 Seeds only 2 in each cell; corolla with a 3-lobed lower lip  
 but no upper . . . . 135. *Acanthus*.
223. Corolla distinctly 2-lipped . . . . 133. *Hygrophila*.  
 Corolla with 5 nearly equal lobes . . . . 134. *Hemigraphis*.
224. (221) Corolla-tube distinct throat not saccate in front . . 225  
 Corolla-tube short, throat saccate in front . . 126. *Angelonia*.
225. Calyx-segments equal . . . . 129. *Vandellia*.  
 Calyx-segments unequal . . . . 128. *Herpestis*.
226. (219) Flowers in capitate or ovoid spikes . . . . 227  
 Flowers in open cymes . . . . 228
227. Fruit leathery, indehiscent . . . . 136. *Lantana*.  
 Fruit dry, partially dehiscent . . . . 137. *Lippia*.
228. (226) Flowers very small, greenish-white . . . . 138. *Premna*.  
 Flowers large, white . . . . 140. *Clerodendron*.

229. (217) Unarmed species . . . . . 230  
 Armed shrubs or under-shrubs ; spines axillary 101. *Azima*.
230. Trees or large shrubs ; petals present . . . . . 231  
 Herbs ; petals wanting . . . . . 233
231. Stamens 5 or fewer ; fruit not tipped by the calyx . . . . . 232  
 Stamens numerous ; fruit large, crowned by the persistent  
 calyx-lobes . . . . . 68. *Psidium*.
232. Flowers 3·6 from small tubercles ; fruit a small hard berry ;  
 rambling shrubs . . . . . 27. *Salacia*.  
 Flowers many, in lax panicles ; fruit a compressed fleshy  
 edible drupe ; considerable trees . . . . . 34. *Bouea*.
233. (230) Stem prostrate, rooting at the nodes . . . . . 234  
 Stems erect . . . . . 70. *Ammannia*.
234. Sepals connate in a short calyx ; stamens free, inserted  
 round mouth of calyx-tube . . . . . 235  
 Sepals free ; stamens connate in a cup below ovary . . . . . 236
235. Capsule 3-5-celled . . . . . 80. *Sesuvium*.  
 Capsule 1-2-celled . . . . . 81. *Trianthema*.
236. (234) Sepals hard, the outer ones 3-ribbed ; stamens 5 ;  
 anthers 2-celled . . . . . 146. *Psilotrichum*.  
 Sepals herbaceous, flexible, not ribbed ; stamens 2 3 ;  
 anthers 1-celled . . . . . 147. *Alternanthera*.
237. (1) Fronds very large as compared with the stem . . . . . 238  
 Fronds small or minute . . . . . 247
238. Fronds circinate ; sporangia on under-surface . . . . . 239  
 Fronds erect ; sporangia spicate in crested clusters on a  
 separate segment . . . . . 243 *Helminthostachys*.
239. Sori confined to margins or veins of under-side of fronds . . . . . 240  
 Sori spread over whole under-surface of fertile fronds or  
 parts of fronds . . . . . 242. *Acrostichum*.
240. Epiphytic or terrestrial ferns . . . . . 241  
 Aquatic ferns, growing in still waters . . . . . 236. *Ceratopteris*
241. Sori remote from margins of fronds . . . . . 242  
 Sori marginal or nearly so . . . . . 244
242. Sori covered by an indusium . . . . . 243  
 Sori without an indusium . . . . . 239. *Polypodium*.
243. Indusium reniform . . . . . 238. *Nephrodium*.  
 Indusium oblong or linear . . . . . 237. *Asplenium*.
244. (241) Sori protected by an indusium . . . . . 245  
 Sori without an indusium . . . . . 246
245. Sporangia attached to under-side of indusium, which con-  
 sists of the intucked margin of the frond 234. *Adiantum*.

- Sporangia not arising from the indusium, which is distinct from the margin of the frond . . . 235. *Pteris*.
246. (244) Fronds grass-like, all similar . . . 240. *Vittaria*.  
Fronds dimorphic . . . 241. *Drymoglossum*.
247. (237) Leaves many, crowded; sporangia orbicular, compressed, 1-celled, 1-valved . . . 244. *Lycopodium*.  
Leaves minute, distant, rudimentary; sporangia turbinate, 3-celled, 3-valved . . . 245. *Psilotum*.

## VI.—SYSTEMATIC CENSUS OF SPECIES.

In the subjoined list of plants hitherto reported from the Sundribuns, the order followed is that of the *Flora of British India*,\* which is referred to throughout; there, descriptions of the majority of the species are to be found. References are also given to Roxburgh's *Flora Indica* † for such of the species as are there described. Moreover, Watt's *Dictionary of the Economic Products of India* ‡ is cited under the species referred to in that work. These references, it is hoped, may lead to the identification of any species that it is found impossible to run down with the aid of the *Guide to the Genera* given in the preceding Chapter, and with the help of the keys to species that are given in the *Census* itself.

In the case of the Cryptogams the references are to Clarke's edition of the *Flora Indica* and to the *Synopsis Filicum*§ of Hooker and Baker. Planted or cultivated species are marked(\*).

## THALAMIFLORÆ.

### I.—RANUNCULACEÆ.

#### 1. *Naravelia* DC.

1. *Naravelia zeylanica* DC.; F. B. I. i. 7. *Atragene zeylanica* F. I. ii. 670. E. D. N 8.

Generally distributed, but not common. Northern Forests, *Calcutta Garden Collectors*! Coast at Tiger Point, *Heinig*!

Vernac. *Murcha*.

Scandent on bushes; stems sometimes twisted into ropes; root tuberous.

DISTRIB.—India; Indo-China; Malaya.

The common Bengali name is Chhagal-bati, which is also used to designate *Damia extensa*.

\* Cited as F. B. I. with volume and page.

† Cited as F. I. with volume and page.

‡ Cited as E. D. with letter and reference number.

§ Cited as Synops. Fil. with page.

## II.—MENISPERMACEÆ.

2. *Tinospora* Miers.

2. *Tinospora tomentosa* Miers; F. B. I. i. 96. *Menispermum tomentosum* F. I. iii. 813.

Jatta, ruins of pagoda, *Prain*!

Vernac. *Padma-guláncha*.

Scandent; possesses the tonic properties of the common Guláncha (*T. cordifolia*).

DISTRIB.—Lower Bengal; Lower Burma: always rare.

## III.—CRUCIFERÆ.

3. *Senebiera* Poir.

3. *Senebiera pinnatifida* DC.

Banks of Mátla river, in sandy places, *Calcutta Garden Collectors*!

A diffuse procumbent annual; properties insignificant.

DISTRIB.—Temp. S. America. Apparently a recently introduced plant in India; reported from Upper Sind (*Cooke, Woodrow*) and from Banda (*Mrs. Bell*); earliest Sundribuns record, 1898.

## IV.—CAPPARIDÆÆ.

4. *Cleome* Linn.

4. *Cleome viscosa* Linn.; F. I. iii. 128; F. B. I. i. 170. E. D. c 1367.

Jatta, among ruins of pagoda, *Prain*!

Vernac. *Húrhúria*.

An erect annual; seeds yield an oil which, with the juice of the plant, is used for ear complaints; seeds also used as food; flowers yellow.

DISTRIB.—Cosmopolitan in tropical and subtropical regions.

5. *Gynandropsis* DC

5. *Gynandropsis pentaphylla* DC.; F. B. I. i. 171. *Cleome pentaphylla* F. I. iii. 126. E. D. G 753.

Canning Town, *Calcutta Garden Collectors*! *Prain*!

Vernac. *Sada Húrhúria*.

An erect annual, cult. or an escape; properties much as in *Cleome viscosa*; flowers pale-purple to white.

DISTRIB.—Cosmopolitan in the tropics.

6. *Cratæva* Linn.

6. *Cratæva religiosa* Forst.; F. B. I. 172.—*Capparis trifoliata* F. I. ii. 571. E. D. c 2039.

Northern forests and clearings, *Heinig!*

Vernac. *Barún, Tikto-shak.*

An unarmed tree; stands long leafless; properties tonic and rubefacient; flowers purplish-yellow.

DISTRIB.—Supposed wild in Malabar; elsewhere planted.

The presence of this in the Sundribun forests is doubtless one of the vestiges of former occupation on mounds or platforms of higher ground, *e.g.*, on the left bank of the Mandabari river.

### 7. *Capparis* Linn.

7. *Capparis sepiaria* Linn.; F. I. ii. 568; F. B. I. i. 177. E. D. C. 427.

Coast, *Heinig!* Jatta, *Prain!*

Vernac. *Kanta Gurkamai.*

A stout thorny climbing shrub; said to possess antiperiodic properties.

DISTRIB.—India; Indo-China; Malaya; Philippines.

This species is very characteristic of the sea-fence immediately behind the beaches, on the Burmese and Andaman coasts.

## V.—BIXINEÆ.

### 8. *Flacourtia* Comm.

8. *Flacourtia sepiaria* Roxb.; F. I. iii. 835; F. B. I. i. 194. E. D. F 624.

Northern forests and clearings; Cheila Bogi river, *Heinig & Gammie!* Jatta, *Prain!*

A thorny bush; properties unimportant.

DISTRIB.—India; Indo-China; Malaya.

## VI.—PORTULACACEÆ.

### 9. *Portulaca* Linn.

9. *Portulaca oleracea* Linn.; F. I. ii. 463; F. B. I. i. 246. E. D. P 1179.

Northern clearings, very rare, *Prain!*

Vernac. *Laniya.*

A prostrate succulent annual; a fair vegetable.

DISTRIB.—Cosmopolitan in the tropics.

## VII.—TAMARISCINEÆ.

### 10. *Tamarix* Linn.

10. *Tamarix gallica* Linn. var. *indica* Dyer; F. B. I. i. 248. T. *indica* F. I. ii. 100. E. D. T 70.

Everywhere on river-banks from the northern forests to sea-face ; especially plentiful in recent clearings.

Vernac. *Ḥhao* ; *Nuna gách*.

A shrub or small tree, up to 20 feet high ; cut for firewood : the galls and bruised twigs provide an indifferent tan.

DISTRIB.—Shores of W. and S. Europe ; N. and Trop. Africa ; S.-E. Asia.

## VIII.—MALVACEÆ.

### 11. *Abutilon* Gaertn.

Leaves and branches white with closely felted down ; flowers yellow ; capsules almost glabrous . . . . *indicum*.

Leaves and branches hispid with spreading hairs ; flowers orange ; capsules hairy . . . . *graveolens* var. *hirtum*.

11. *Abutilon indicum* G. Don ; F. B. I. i. 326. *Sida indica* F. I. iii. 179. E. D. A 89.

Northern clearings, rare, *Calcutta Garden Collectors* ! *Prain* !

Vernac. *Potári*, *Kanghi*.

A shrubby weed ; stems give a tolerable fibre ; juices demulcent and diuretic ; seeds said to be laxative.

DISTRIB.—Cosmopolitan, or nearly so, in the Tropics.

12. *Abutilon graveolens* G. Don. VAR. *hirtum* Mast. ; F. B. I. i. 327.—*Sida graveolens* F. I. iii. 179. E. D. A 84.

Northern clearings, very rare, *Calcutta Garden Collectors* !

Vernac. *Bar Potári*, *Bara Kanghi*.

A shrubby weed with a heavy odour ; properties as in *A. indicum*.

DISTRIB.—Tropical and subtropical regions of the Eastern Hemisphere and Australia.

### 12. *Malachra* Linn.

13. *Malachra capitata* Linn. ; F. B. I. i. 329. E. D. M 60.

In all the northern clearings, plentiful.

Vernac. *Ban Bhindi*, *Ban Dheras*.

An erect annual, apparently recently introduced to India ; yields a soft and silky but apparently not very valuable fibre.

DISTRIB.—Tropical America ; also Tropical West Africa, but there, as in India, probably introduced.

### 13. *Hibiscus* Med.

Free portion of bracteoles twice the length of their cupular base ; carpels 2-locular at their bases only ; stipules large, spatulate ; flowers yellow with rose-pink veins . . . . *tortuosus*.

Free portion of bracteoles much shorter than their cupular base; carpe ls completely 2-locular throughout; stipules medium, lanceolate; flowers yellow with crimson eye, changing to brownish red . . . . . *tiliaceus*.

14. *Hibiscus tortuosus* Wall. (not of Roxb.).

"Estuary of the Hughli," Wallich (*Catalogue* n. 1913 A: 1817)!

This plant has only once been collected in an apparently wild state. It grows well in the Calcutta Gardens, where there are some old and large specimens. It has the habit, the pubescence, and much the appearance of *H. tiliaceus*, but has the large stipules and exactly the flowers of *H. macrophyllus* which is, however, a tree, sometimes of considerable size. The fruit, which forms freely, is curiously intermediate between the fruit of *H. tiliaceus* and *H. macrophyllus*. In *H. tiliaceus* the five carpels are each completely subdivided by accessory partitions into 10 chambers; in *H. macrophyllus* the five carpels show no trace of such subdivision. In *H. tortuosus* there are partial dissepiments in each carpel. This intermediate character, with the fact that in the Calcutta Garden the seeds of *H. tortuosus* are always abortive, gives rise to the suspicion that we may have here to do with a natural hybrid between *H. tiliaceus*, the common *Bhola* and *H. macrophyllus* which, though not a Sundribun plant, occurs in Chittagong. In any case *H. tortuosus* should be looked for, more especially in the eastern parts.

15. *Hibiscus tiliaceus* Linn.; F. I. iii. 192; F. B. I. i. 343. *H. tortuosus* F. I. iii. 192. *H. tiliaceus* var. *tortuosus* F. B. I. i. 343. E. D. H 255.

Plentiful everywhere, from the northern border to the sea-face.

Vernac. *Bhola*, *Chelwa*.

A heavy climber, injurious to forest growth: the inner bark yields a strong fibre, used by the wood-cutters for cordage.

DISTRIB.—Cosmopolitan on tropical coasts.

14. *Thespesia* Corr.

16. *Thespesia populnea* Corr.; F. B. I. i. 345. *Hibiscus populneus* F. I. iii. 190. E. D. T. 392.

Coast; at Tiger Point, *Heinig*! but chiefly west of the Raimangal river (*Heinig*).

Vernac. *Dumbila* (*Heinig*); *Paras*; *Paras Pipal*.

A handsome tree, reaching 30 feet in height; wood good; inner bark yields a fair fibre; capsules give a yellow dye.

DISTRIB.—Tropical sea-coasts of the Eastern Hemisphere.

IX.—STERCULIACEÆ

15. *Heritiera* Ait.

17. *Heritiera minor* Roxb.; F. I. iii. 142. *H. Fomes* F. B. I. i. 363. E. D. H 134.



Everywhere from the northern forests to the sea.

Vernac. *Sundri*.

A small to medium tree, reaching 40-50 feet in height; wood excellent, hard, tough and durable, red in colour; used in boat-building, also for posts, planks, rafters, jhools and dabbas of boats, furniture and firewood; trunk often much buttressed; roots send up vertical blind suckers; charcoal obtained from this tree is used by gold and silver-workers.

DISTRIB.—Delta of the Irrawaddy and (*vide* Masters in *F. B. I.*) Borneo.

*Heritiera littoralis Dryand.*, stated in the *F. B. I.*, and in various other works on Indian Botany, to occur on the coasts of Bengal, has never been collected in the Sundribuns.

### 16. *Kleinhovia* Linn.

18. *Kleinhovia Hospita* Linn., *F. I.* iii. 141; *F. B. I.* i. 364.

E. D. K 27.

Sundribuns, *Ellis*!

Vernac. *Bhola*.

A tall handsome tree; bark provides coarse rope (*Ellis*).

DISTRIB.—E Tropical Africa; Malaya; Philippines.

Unfortunately Mr Ellis, who alone has sent Sundribun specimens of this tree, does not give a precise locality. The species was not introduced to the Calcutta Garden, from the Moluccas, till 1798; it can hardly then be a species in some now abandoned clearing. The tree does not occur in existing clearings; the distribution of the species is precisely that of many of the species truly wild in the Sundribuns; there is, therefore, nothing against *Kleinhovia* being a genuine Sundribun plant. At all events the tree deserves to be carefully looked for again.

## X.—TILIACEÆ.

### 17. *Brownlowia* Roxb.

19. *Brownlowia lanceolata* Benth.; *F. B. I.* i. 381. E. D. B 895.

Widely disseminated but nowhere very plentiful; chiefly found on the banks of creeks and rivers, *Griffith*! *Heinig*! *Prain*!

Vernac. *Kedar Sundri*; *Bhola Sundri*.

A small to medium tree, in leaf rather resembling *Sundri*; wood used as fuel.

DISTRIB.—Tenasserim.

### 18. *Corchorus* Linn.

20. *Corchorus acutangulus* Lamk.; *F. B. I.* i. 398. *C. fuscus* *F. I.* ii. 582. E. D. C 1840.

Northern clearings, not common, *Clarke*! *Prain*!

Vernac. *Titapát*.

An annual herb, rather resembles jute; properties unimportant.

DISTRIB.—Tropics of Eastern Hemisphere; West Indies.

## DISCIFLORÆ.

## XI.—GERANIACEÆ.

19. *Oxalis* Linn.

21. *Oxalis corniculata* Linn.; F. I. ii. 457; F. B. I. i. 436. E. D. O 547.

Northern clearings, very rare, *Heinig & Gammie*!

Vernac. *Chuka Tripati*; *Amrul*.

A small weed of cultivated ground with 'trefoil' leaves; properties not very important; slightly acid and refrigerant or tonic; sometimes used as a vegetable.

DISTRIB.—Cosmopolitan in cultivated ground.

## XII.—RUTACEÆ.

20. *Glycosmis* Corr.

22. *Glycosmis pentaphylla* Corr.; F. B. I. i. 499. *Limonia pentaphylla* F. I. ii. 381. E. D. G 271.

Northern clearings, *Calcutta Garden Collectors*! ruins of Mandabari, *Heinig & Gammie*! ruins of Jatta, *Prain*!

Vernac. *Ashhoura*.

A shrub, evergreen; fruit eaten; twigs used as tooth-cleaners.

DISTRIB.—S.-E. Asia; Australia.

This species is a common constituent of village shrubberies in the Gangetic plain and is an almost certain indication, when it occurs elsewhere, of former human habitation.

21. *Micromelum* Bl.

23. *Micromelum pubescens* Bl.; F. B. I. i. 501. *Bergera integririma* F. I. ii. 376.

Eastern Sundribuns, *vide Roxburgh*.

Vernac. *Ban-kunch*.

A small, much-branched tree.

DISTRIB.—S.-E. Asia; Polynesia.

Roxburgh says that the tree occurs on the eastern banks of the mouth of the Megna; it might, therefore, be looked for on the opposite or western banks, from Shabuzpur northwards.

22. *Paramignya* Wight.

24. *Paramignya longispina* Hook. f.; F. B. I. i. 511.

Eastern Sundribuns, at Baniakhali, *Heinig*!

Vernac. *Ban Nimbu*.

A thorny under-shrub; fruit used in cases of colic.

DISTRIB.—Malayan Peninsula.

23. *Egle* Corr.

- 25.
- Egle*
- Marmelos Corr.; F. I. ii. 579; F. B. I. i. 516. E. D. A 534.

Jatta, among the ruins, *Prain*!Vernac. *Bél, Vilva*.

A medium to large tree; yields a gum; also a dye from the rind of the fruit; timber white, hard but not durable; fruit medicinal, when unripe astringent, when ripe cooling and mildly laxative; used in dysentery. The tree is sacred; this perhaps explains its existence beside an abandoned temple.

DISTRIB.—Drier parts of India.

## XIII.—MELIACEÆ.

24. *Amoora* Roxb.

- 26.
- Amoora*
- cucullata Roxb.; F. B. I. i. 560.
- Andersonia cucullata*
- F. I. ii. 212. E. D. A 983.

General, in swamp-forests, from the northern border to the sea-face.

Vernac. *Amúr; Latmi, Natmi*.

A considerable tree, 30-40 feet high; wood hard, apt to split, of red or brown colour, used for posts and fuel; leaves when bruised applied to reduce inflammation; roots with vertical blind suckers.

DISTRIB.—Andamans; Malay Peninsula.

25. *Carapa* Aubl.

Roots with vertical blind suckers; evergreen; bark smooth; flowers February-March; fruits the size of an orange

*moluccensis* var. *gangetica*.

Roots with no root-suckers; deciduous; bark rough; flowers most of the year; fruits the size of a shaddock . . . *obovata*.

- 27.
- Carapa*
- moluccensis Lamk VAR.
- gangetica*
- .

Forests east of the Arpangassia, in swampy localities, *Ileinig*! *Lacc*!Vernac. *Pussur*.

A tree 60 feet high; leaves fall after the new flush so that the species is practically evergreen; bark dark-brown, moderately exfoliating, deep-red within; wood white, reddening on exposure, hard, used for tool-handles, hand-spikes, helves, wheel-spokes, house-posts, planking; withstands moisture. The tree exudes a clear, brown, brittle gum: the fruit yields an illuminating and lubricating oil. The roots send up copious blind root-suckers.

This is, at least, a very distinct variety of *C. moluccensis* and may prove to be a distinct species; the shape of the leaflets is different, though the texture is much the same. The flowers, however, are the same in size and structure and it further agrees with typical *C. moluccensis* in the size of its fruit and in its habit of sending up blind root-suckers. In the Sundribuns this tree affects only the lowest parts of the interior of the swampy islands. The leaflets, though with more rounded

bases than those of *C. obovata*, and though of distinctly thinner texture, nevertheless more resemble these in general shape than they do the leaflets of any hitherto known variety of *C. moluccensis*. They are more obtuse at the apex than is the case with *C. moluccensis* var. *elliptica* Koord. & Val.; our tree further differs from that well-marked form in having only 2—1-jugate leaves, just as in *C. obovata*, never 3-jugate leaves. The form most nearly related to var. *gangetica* appears to be the Java tree named provisionally *C. moluccensis* var. *ovalifolia* by Koorders and Valetton. Our material of this last variety is not, however, sufficiently extensive for a definite decision to be arrived at; so far as it goes it indicates that the two varieties, *gangetica* and *ovalifolia*, are not the same; in any case no characters have been given for var. *ovalifolia*. According to Schimper, whose very careful account of the Strand-flora, based chiefly on Malayan observations, has become classical, *C. moluccensis* in muddy places sends up blind root-suckers, like *Sonneratia*, *Avicennia*, etc.\* This is not the writer's recollection with regard to the form usually accepted as typical *C. moluccensis*, so far as the Coco Group is concerned; the tree in question there affects rocky headlands only and does not accompany *C. obovata* into the swamp-forests: this was also the experience of Kurz as regards the tree in the Andamans.†

28. *Carapa obovata* Bl. *C. moluccensis* F. B. I. i. 567 partly, not of Lamk. *Xylocarpus Granatum* F. I. ii. 240. E. D. C 482.

Everywhere throughout the Sundribuns, on river-banks.

Vernac. *Dhundol*; *Gamur*; *Karam Bhola*.

A tree occasionally 40 feet high, usually smaller than the last species; leaves deciduous; bark light-brown, freely exfoliating in large broad flakes, light-red within; wood reddish-brown much resembling that of the preceding in qualities. The fruit is used in tanning; the roots have no root-suckers but form instead horizontal thickened sections that protrude through the mud (as in *Gengwa*) to act as respiratory organs.

DISTRIB.—S.-E. Asia on banks of muddy sea-creeks.

#### XIV.—OLACINEÆ.

##### 26. *Olex* Linn.

29. *Olex scandens* Roxb.; F. I. i. 163; F. B. I. i. 575. E. D. O 127. Northern forests, *Heinig*!

Vernac. *Koko Aru*.

A large woody climber; properties unimportant.

DISTRIB.—S.-E. Asia.

#### XV.—CELASTRINEÆ.

##### 27. *Salacia* Linn.

30. *Salacia prinoidea* DC.; F. B. I. i. 626. *Johnia coromandeliana* F. I. i. 169.

\* Schimper: *Die indo-malayische Strand-flora*, p. 99 (1891).

† Kurz: *Forest Flora of British Burma*, i, 226 (1877).

General, especially in the northern forests, but never common.

Vernac. *Chot-boroni*; *Modhu-phal*; *Dimal*.

A large climber or small straggling tree, 20 feet high; only used for fuel.

DISTRIB.—S.-E. Asia.

## XVI.—RHAMNACEÆ.

### 28. *Zizyphus* Juss.

Leaves glabrous on upper side, woolly below . . . *Jujuba*.

Leaves softly pubescent above, silky below . . . *Enoplia*.

31. \**Zizyphus Jujuba* Lamk.; F. I. i. 608; F. B. I. i. 632. E. D. z

231.

Occasionally in clearings.

Vernac. *Bér*.

A small tree; often planted, here certainly so: fruit of very poor quality.

DISTRIB.—Tropics of Eastern Hemisphere and of Australia.

32. *Zizyphus Enoplia* Mill.; F. I. i. 611; F. B. I. i. 634. E. D. z

263.

Jatta, *Prain*!

Vernac. *Shiakol*.

A straggling shrub, useful as a hedge-plant; fruit eaten, but quality poor.

DISTRIB.—Tropical Asia and Australia.

Here the species is probably a remnant of cultivation near the old temple.

## XVII.—AMPELIDÆ.

### 29. *Vitis* Linn.

Leaves simple:—

Stems 4-winged, fleshy . . . *quadrangularis*.

Stems not winged, not fleshy . . . *latifolia*.

Leaves 3-foliolate . . . *trifolia*.

33. *Vitis quadrangularis* Wall.; F. B. I. i. 645. *Cissus quadrangularis* F. I. i. 407.

Satkhirra, *Clarke*!

Vernac. *Harjora*.

A succulent almost leafless climber; properties insignificant.

DISTRIB.—Tropical E. Africa; S.-E. Asia.

34. *Vitis latifolia* Roxb.; F. I. i. 661; F. B. I. i. 652. E. D. v 213.

Jatta, *Prain*!

Vernac. *Govila*.

A large climber; stems may be twisted into ropes.

DISTRIB.—India generally; Assam.

A species almost certainly introduced by bird-agency.

35. *Vitis trifolia* Linn *V. carnos*a F. B. I. i. 654. *Cissus carnos*a F. I. i. 409. E. D. v 195.  
Everywhere common, from the northern clearings to the sea-face.  
Vernac. *Goeli-lata*; *Amal-lata*.  
A slender climber; stems twisted into ropes.  
DISTRIB.—S.-E. Asia.

30. *Leca* Linn.

36. *Leca sambucina* Willd.; F. I. i. 657; F. B. I. i. 666. E. D. L 241.  
Eastern forests, *Heinig & Gammie*!  
Vernac. *Kukur Jhiwa*.  
A glabrous shrub; properties unimportant.  
DISTRIB.—S.-E. Asia; N. Australia.

XVIII.—SAPINDACEÆ.

31. *Cardiospermum* Linn.

37. *Cardiospermum Halicacabum* Linn.; F. I. ii. 292; F. B. I. i. 670.  
E. D. C 551.  
Northern clearings, rare, *Prain*!  
A slender climbing herb; roots and seeds used medicinally.  
DISTRIB.—Almost cosmopolitan in the Tropics.

32. *Allophylus* Linn.

38. *Allophylus* Cobbe Bl. VAR. *glabra* F. B. I. i. 672. *Ornithotrope glabra* F. I. ii. 267. E. D. A 787.  
Sundribuns, *T. Thomson*!  
A deciduous shrub; properties unimportant.  
DISTRIB.—S.-E. Asia; N. Australia.  
This has not been collected in the Sundribuns for half a century; it might be looked for. It is plentiful in the Andaman sea-fence.

33. *Aphania* Bl.

39. *Aphania Danura* Radlk. *Scytalia Danura* F. I. ii. 274.  
*Sapindus Danura* F. B. I. i. 684.  
Eastern and northern forests, *Clarke*! *Heinig*! *Calcutta Garden Collectors*!  
Vernac. *Badona*; *Nuncha*.  
An evergreen shrub; cut for firewood.  
DISTRIB.—India; Indo-China.

## XIX.—ANACARDIACEÆ.

34. *Bouea* Meissn.

40. *Bouea burmanica* Griff.; F. B. I. ii. 21. *Mangifera oppositifolia* F. I. i. 640. E. D. B 785.

Sundribun, "reserved forests," *fide* Heinig.

Vernac. *Miri-âm*; *Uri-âm*.

A timber tree 50 feet high, used for constructing parts of boats above the water-line; fruit edible.

DISTRIB.—Pegu; Tenasserim; Andamans; Java.

Of this species, which is given in Mr. Heinig's list, no specimens have ever been received in the Calcutta Herbarium from the Sundribuns. In response to an enquiry on the subject Mr. Heinig has kindly replied as follows:—"I regret that I have lost all recollection of *Bouea burmanica*, but I find the following among my notes of Sundribuns species:—*B. burmanica*. Occurrence doubtful. Probably introduced. Cultivated near villages for the sake of its fruit."

The species should, therefore, be again looked for. Mr. Heinig suggests that it would probably be found, if it occurs at all, on the mounds or raised platforms of higher grounds forming vestiges of the old salt-makers and dacoits, especially near the ruins not far from Cobaduk Revenue Station in Coupe No. 1 of the Khulna Working Circle, on the left bank of the Mandabari river.

35. *Odina* Roxb.

41. *Odina Wodier* Roxb.; F. I. ii. 293; F. B. I. ii. 29. E. D. O 38.

Northern clearings, self-sown or planted, *Calcutta Garden Collectors!* *Prain!* Mandabari ruins, *Heinig & Gammie!* Jatta ruins, *Prain!* Ambaria khal, at a small cleared camping-ground, *Prain!* Sea-face, *Heinig!*

Vernac. *Ĵiyal*; *Kamila-gách*.

An ill-favoured deciduous tree, 40-50 feet high; wood hard but not durable; bark astringent.

DISTRIB.—India; Indo-China.

The sea-face locality is based on the presence at Calcutta of a specimen, in leaf only, sent by Mr. Heinig as *Kamila-gách*. There does not seem to the writer to be much doubt as to the accuracy of his determination; the communication of an unusual vernacular name still, however, leaves some; having regard to this fact and to the further doubt whether *Odina* deserves to be considered other than a deliberately introduced species in the Sundribuns, complete botanical material of the tree known as *Kamila-gách* is desirable.

## CALYCIFLORÆ.

## XX.—LEGUMINOSÆ.

36. *Crotalaria*, Linn.

Leaves simple:—

Flowers blue and white, in lateral as well as terminal racemes;  
leaves ovate . . . . . *verrucosa*.

Flowers yellow, in terminal racemes only ; leaves oblanceolate-oblong . . . . . *retusa*.

Leaves 3-foliolate ; flowers yellow, mostly in long terminal racemes . . . . . *Saltiana*.

42. *Crotalaria verrucosa* Linn. ; F. B. I. ii. 77. *C. angulosa* F. I. iii. 273. E. D. C 2164.

Frequent in northern clearings, *Calcutta Garden Collectors* !  
*Prain* ! also on the coast at Tiger Point, *Heinig* !

Vernac. *Ban Qan*.

A shrubby herb ; properties unimportant.

DISTRIB.—Trop. Asia, Africa and America.

43. *Crotalaria retusa* Linn. ; F. I. iii. 272 ; F. B. I. ii. 75. E. D. C 2155.

Coast, at Tiger Point, *Heinig* !

Vernac. *Choika* ; *Bhil Jhanjhan*.

A robust shrubby herb ; yields a tolerable fibre.

DISTRIB.—Trop. Asia ; introd. in Trop. Africa and America.

Seeds almost certainly washed down by the rivers.

44. *Crotalaria Saltiana* Andr. *C. striata* F. B. I. ii. 84 partly. E. D. C 2159.

Sea-face, *Lace* ! Northern clearings, *G. Thomson* ! *Calcutta Garden Collectors* !

An erect shrubby herb ; gives a fair fibre.

DISTRIB.—Trop. America and Africa ; S.-E. Asia.

### 37. *Cyamopsis* DC.

45. \**Cyamopsis psoraloides* DC. ; F. B. I. ii. 92. *Dolichos fabæformis* F. I. iii. 316. E. D. C 2514.

Sundribuns, cultivated, *Calcutta Garden Collectors* !

Vernac. *Guar*.

An annual crop ; plants erect, stoutish, 2-3 feet high, with thick straight fleshy pods. Probably only occasionally cultivated in Sundribun clearings, as it has not been reported from these since 1845.

DISTRIB.—India generally, in the drier regions ; and Afghanistan.

### 38. *Sesbania* Pers.

46. \**Sesbania grandiflora* Pers. , F. B. I. ii. 115. *Æschynomene grandiflora* F. I. iii. 331. E. D. S. 1186.

Planted at almost every clearing.

Vernac. *Bok-phul* ; *Agati*.

A soft-wooded, quick-growing, short-lived tree, planted to support climbing vegetables ; also leaves and flowers eaten.

DISTRIB.—Mascarenes to Malaya and N. Australia.



39. *Desmodium* Desv.

47. *Desmodium umbellatum* DC.; F. B. I. ii. 161. *Hedysarum arboreum* F. I. iii. 360.

Generally distributed, but nowhere plentiful.

A large shrub or small tree; used for firewood.

DISTRIB.—Mascarenes; coasts of S.-E. Asia; Polynesia.

40. *Abrus* Linn.

48. *Abrus precatorius* Linn., F. I. iii. 258; F. B. I. ii. 175. E. D. A 51.

Jatta, *Prain*!

Vernac. *Kunch*.

A climbing plant with slender stems; seeds used as goldsmiths' weights (*rati*), and as ornamental and rosary beads; root medicinal.

DISTRIB.—Cosmopolitan in the Tropics.

The species is more or less sacred, which may explain its occurrence beside the ruined temple at Jatta.

41. *Teramnus* Sw.

49. *Teramnus flexilis* Benth.; F. B. I. ii. 185.

Eastern Sundribuns, rare, *Clarke*!

A somewhat extensive climber; properties unimportant.

DISTRIB.—E. Himalaya; Assam; Chittagong.

This has only been found east of the Madumati, but may be expected to occur also on the western bank. From the distribution of the species it is possible that the seeds may have been brought down by the Brahmaputra or some of its tributaries.

42. *Mucuna* Adans.

50. *Mucuna gigantea* DC., F. B. I. ii. 186. *Carpopogon giganteum* F. I. iii. 286.

Eastern Sundribuns, at Arpangassia Khal, Cheila Bogi River and elsewhere, *Kurz*! *Heinig*! *Gammie*! *Lace*!

A very extensive climber; stems twisted into ropes.

DISTRIB.—Coast forests of S.-E. Asia.

43. *Erythrina* Linn.

- 1 *Erythrina indica* Lamk.; F. I. iii. 249; F. B. I. ii. 188. E. D. E 342.

Sea-face, *Heinig*!

Vernac. *Palita Mandar*.

A tall prickly tree, quick-growing, soft-wooded but the wood rather durable.

DISTRIB.—Coasts of S.-E. Asia and Polynesia; elsewhere planted.

44. *Canavalia* DC.

Pods not turgid, deeply double-channelled along dorsal suture  
*lineata*.

Pod turgid, almost flat along dorsal suture, endocarp separating  
*turgida*.

52. *Canavalia lineata* DC. *C. obtusifolia* F. B. I. ii. 196 (not of DC.) *Dolichos obcordatus* F. I. iii. 303. E. D. C 294.

Sea-face, *Heinig*!

A glabrous perennial; a good sand-binding species.

DISTRIB.—Cosmopolitan on tropical coasts.

53. *Canavalia turgida* Grah. *C. ensiformis* var. *turgida* F. B. I. ii. 196. *Dolichos rotundifolius* F. I. iii. 302.

Common on river-banks in the central and northern forests.

A rather extensive climber, always near the sea.

DISTRIB.—Coasts of S.-E. Asia.

45. *Phaseolus* Linn.

Stipules attached by their bases; considerable climbers with entire leaflets and large white and purple flowers . . . *adenanthus*.

Stipules attached by their centres; small prostrate herbs with three-lobed leaflets and small yellow flowers . . . *trilobus*.

54. *Phaseolus adenanthus* Mey.; F. B. I. ii. 200. *P. alatus* F. I. iii. 288 (not of Linn.) E. D. P 484.

River-banks of northern forests and clearings.

Vernac. *Ban Barbati*.

A rather extensive climber; root tuberous, sometimes eaten.

DISTRIB.—Cosmopolitan in the Tropics.

55. *Phaseolus trilobus* Ait.; F. I. iii. 298; F. B. I. ii. 201. E. D. P 523.

Northern clearings, occasional. *Kurz*! *Clarke*! *Prain*!

Vernac. *Mugáni*.

A small wild pulse; a tolerable fodder.

DISTRIB.—Africa and Asia in tropical and subtropical regions.

46. *Vigna* Savi.

56. *Vigna luteola* Benth.; F. B. I. ii. 205. *Dolichos gangeticus* F. I. iii. 310.

General.

Vernac. *Ban Barbati*.

A trailing or climbing perennial; properties unimportant.

DISTRIB.—Cosmopolitan in the Tropics, near the coast.

47. *Atylosia* W. & A.

57. *Atylosia scarabæoides* Benth ; F. B. I. ii, 215. *Dolichos scarabæoides* F. I. iii. 315. E. D. R 347.

Jatta, *Prain* !

Vernac. *Banur Kalai*.

A slender biennial climber ; eaten by cattle, otherwise valueless.

DISTRIB.—Mascarenes ; S.-E. Asia.

48. *Flemingia* Roxb.

58. *Flemingia congesta* Roxb. ; F. I. iii 340 ; F. B. I. ii. 228. E. D. F 633.

"Delta of the Ganges," *Meyne* (1796) *fide Roxburgh*.

Vernac. *Bara Salphan*.

An erect woody shrub ; properties unimportant.

DISTRIB.—S.-E. Asia.

The *locus classicus* for this species is given by Roxburgh as the "Delta of the Ganges"—the term generally employed by him when speaking of the Sundribuns. The species has never been reported again from this area ; it might, however, be looked for with a view to confirming Roxburgh's record.

49. *Dalbergia* Linn. f.

Branches spinescent ; a usually erect shrub . . . *spinosa*.

Branches unarmed ; a considerable climber . . . *torta*.

- 59 *Dalbergia spinosa* Roxb. ; F. I. iii. 233 ; F. B. I. ii. 238. E. D. D 84.

General, on river-banks and near the sea-face.

Vernac. *Amanta*.

A thorny, sometimes climbing shrub ; properties unimportant.

DISTRIB.—Coasts of Chittagong, Burma and Coromandel.

60. *Dalbergia torta* Grah. *D. monosperma* F. B. I. ii. 237. E. D. D 48.

General, especially plentiful in the eastern forests.

Vernac. *Panchioli*.

A scandent shrub ; cut for firewood.

DISTRIB.—Coasts of S.-E. Asia ; N. Australia ; Polynesia.

50. *Pongamia* Vent.

61. *Pongamia glabra* Vent. ; F. B. I. ii. 240. *Galedupa indica* F. I. iii. 239. E. D. P 1121.

General, on river-banks and in the forests, as far as the sea.

Vernac. *Pitajora* ; *Koronja* ; *Kerran* ; *Dalkirancha*.

A tree, up to 50 feet high; wood white, turning yellow on exposure, hard, but liable to attack by insects; bark yields a gum; seed yields an oil (*Karanj-ka-tél*) used for burning and greatly used in native medicine for skin-diseases.

DISTRIB.—Mascarenes; coasts of S.-E. Asia; Polynesia; elsewhere often planted.

**51. Derris Lour.**

Vexillary stamen free; sutures of pod sinuate between the seeds

*sinuata.*

Vexillary stamen more or less united with the others; pod not sinuate between the seeds:—

Pod narrow, pointed at both ends, several-seeded *scandens.*

Pod suborbicular, obtuse; seeds solitary *uliginosa.*

**62. Derris sinuata** Thw.; F. B. I. ii. 246!

Sea-face, at Tiger Point, *Heinig!*

Vernac. *Sundri-lata*; *Mahajani-lata.*

A large climber; stems twisted into ropes for tying logs.

DISTRIB.—India; Indo-China; Malaya: in coast forests.

**63. Derris scandens** Benth.; F. B. I. ii. 241. *Dalbergia scandens* F. I. iii. 232. E. D. D 330.

General.

Vernac. *Nioisha*, *Noa-lata.*

A large climber; properties unimportant.

DISTRIB.—S.-E. Asia; N. Australia: not confined to the coasts.

**64. Derris uliginosa** Benth.; F. B. I. ii. 241. *Galedupa uliginosa* F. I. iii. 243.

General.

Vernac. *Kelia-lata*; *Pan-lata.*

A large evergreen scandent shrub; stems twisted into ropes for tying logs.

DISTRIB.—E. Africa; Mascarenes; S.-E. Asia; Polynesia: on coasts and on muddy banks of tidal rivers.

**52. Cæsalpinia Linn.**

Pod covered with wiry prickles; petals narrow *Bonducella.*

Pod smooth; petals broad *Nuga.*

**65. Cæsalpinia Bonducella** Flem.; F. I. iii. 357; F. B. I. ii. 254. E. D. c 6.

Sea-face; on skirts of forests; also in clearings for cultivation, *Calcutta Garden Collectors! Heinig!*

Vernac. *Nátá*; *Nátá Karanj.*

A large thorny climber; seeds, ground and mixed with pepper, are taken in cases of fever; also worn as necklaces.

DISTRIB.—Cosmopolitan in the Tropics.

66. *Cesalpinia Nuga* Ait.; F. B. I. ii. 277. *C. paniculata* F. I. ii. 364. E. D. C 30

Everywhere, from northern clearings to sea-face, common.

Vernac. *Nútua*; *Nétu*; *Shingri-lata*.

A prickly scandent shrub; properties unimportant.

DISTRIB.—Coasts of S.-E. Asia; N. Australia; Polynesia.

### 53. *Mezoneuron* Desf.

67. *Mezoneuron cucullatum* W. & A., F. B. I. ii. 258. *Cæsalpinia cucullata* F. I. ii. 358

"Delta of the Ganges," *Carey* (1796) *fide Roxburgh*.

A very extensive prickly climber, destructive to forest-growth.

DISTRIB.—S.-E. Asia; Malaya.

As in the case of *Flemingia congesta*, the *locus classicus* for this species is the "Delta of the Ganges." It has not been obtained again in the Sundribuns, but should be carefully looked for.

### 54. *Parkinsonia* Linn.

68. \* *Parkinsonia aculeata* Linn.; F. B. I. ii. 260. E. D. P 322.

Planted in some of the northern clearings

Vernac. *Belati Kikar*.

A hedge plant; yields fair fuel and makes good charcoal.

DISTRIB.—Native of Tropical America.

### 55. *Cassia* Linn.

Trees, with indehiscent, cylindric, woody pods; stamens 10 *Fistula*.  
Herbs or shrubs, with dehiscent, compressed pods; stamens 7:—

Leaves with a single large gland near base of common petiole;  
leaflets 6-12 pairs; a small shrub . . . *Sophera*.

Leaves with two glands, one between each of the lower pairs of  
leaflets; leaflets 3 pairs; an annual herb . . . *Tora*.

69. *Cassia Fistula* Linn.; F. I. iii. 333; F. B. I. ii. 261. E. D. C 756.

Jatta, among ruins, *Prain*! also "Reserved Forests," *fide Heinig* in list.

Vernac. *Shongrál* (*Heinig*); *Amaltas*

The "Indian Laburnum," a handsome tree, 50 feet high; wood red, hard, used for posts, rice-pounders and the like; bark used for dyeing and tanning.

DISTRIB.—S.-E. Asia: often planted.

Mr. Heinig includes this in his list but has not sent specimens. Replying to an enquiry regarding the tree, Heinig writes:—"As for *Cassia Fistula* I have got a note:—'An introduced, not an indigenous species.' So far as I recollect (although at this time, six years after my departure from the Sundribuns, I cannot feel sure) I found the species on those mounds or platforms of higher ground forming vestiges of the old salt-makers or dacoits, and would

General, but not plentiful in the central and eastern forests, *Heinig! Heinig & Gammie! Prain!*

Vernac. *Bhídla; Bháila; Bhádala; Shundal; Somdal; Hinga; Hingeh.*

A tree 30-40 feet high; wood reddish-brown, hard; used for beams, girders of bridges, house-posts, and fuel: the tree coppices freely.

DISTRIB.—Coast-forests of the Mascarenes; Indo-China; Malaya; Polynesia: not elsewhere in India.

### 59. *Entada* Adans.

75. *Entada Pursaetha* DC. *E. scandens* F. B. I. ii. 287. *Mimosa scandens* F. I. ii. 554. E. D. E 219.

Eastern forests.

Vernac. *Gila.*

A large climber; seeds roasted and eaten.

DISTRIB.—Cosmopolitan in the Tropics.

Though included in Heinig's list, specimens of this have not been sent from the Sundribuns: Heinig's record is, however, confirmed by the existence of an excellent coloured drawing of the plant in the Sundribun Forest office.

### 60. *Acacia* Linn.

Erect; branches armed with stipular spines:—

Flowers yellow; pod thickened and sinuate between the seeds

*arabica.*

Flowers purple; pod thin, flat and not sinuate . . . *tomentosa.*

Climbing; branches without spines but armed with many recurved prickles:—

Flowers yellowish; pod thick, succulent, somewhat depressed between the seeds . . . *concinna.*

Flowers whitish; pod thin, coriaceous and flat . . . *Intsia.*

76. \**Acacia arabica* Willd.; F. B. I. ii. 293. *Mimosa arabica* F. I. ii. 557. E. D. A 101.

Occasionally planted in the northern clearings, *Calcutta Garden Collectors! Clarke! Frain!*

Vernac. *Babul; Kikar.*

A shrub or tree; wood good; yields an excellent gum; a good tan; and an indifferent dye.

DISTRIB.—Tropical Africa; India generally.

This is only planted in Sundribun clearings and thrives very indifferently.

77. *Acacia tomentosa* Willd.; F. B. I. ii. 294. *Mimosa tomentosa* F. I. ii. 558. E. D. A 299.

Northern forests, *Calcutta Garden Collectors* !

A small tree ; properties insignificant.

DISTRIB.—Western India and Ceylon ; here almost certainly planted : collected in 1856, not received from the Sundribuns since.

78. *Acacia concinna* DC. ; F. B. I. ii. 296. *Mimosa concinna* F. I. ii. 565. E. D. A 200.

Northern forests, *Calcutta Garden Collectors* !

Vernac. *Ban-ritha*.

A prickly scandent bush ; pods used as a substitute for soap ; also as a source of medicine.

DISTRIB.—S.-E. Asia : not collected in the Sundribuns since 1856.

79. *Acacia Intsia* Willd. ; F. B. I. ii. 297. *Mimosa Intsia* F. I. ii. 565. E. D. A 233.

Northern forests, *Calcutta Garden Collectors* !

A large prickly climber, destructive to forest-growth.

DISTRIB.—India generally : not collected in the Sundribuns since 1845.

## XXI.—DROSERACEÆ.

### 61. *Aldrovanda* Linn.

80. *Aldrovanda vesiculosa* Linn. ; F. B. I. ii. 425. *A. verticillata* F. I. ii. 112.

Northern clearings, *Kurs* !

Vernac. *Malacca Fhangi*.

A floating aquatic, apparently very rare.

DISTRIB.—C. Europe ; Australia.

A species, with a peculiarly detached distribution, unless it occurs, but has been overlooked, in intermediate localities. Roxburgh, writing prior to 1814 (not published till 1832), does not say it is rare ; Voigt, writing in 1845, mentions his failure to find it near Calcutta. It was rediscovered by T. Thomson in 1855, in salt-pans south of Calcutta and just to the north of the Sundribun area, and again in 1867 by S. Kurz in salt-pans just within the northern boundary of our region.

## XXII.—RHIZOPHOREÆ.

### 62. *Rhizophora* Linn.

Cymes longer than petioles, usually 3-flowered, from axils of leaves ; flowers pedicelled ; petals fleshy, woolly in front *mucronata*.

Cymes shorter than petioles, unusually 2-flowered, from axils of fallen leaves ; flowers sessile ; petals thin, glabrous *conjugata*.

81. *Rhizophora mucronata* Lamk. ; F. B. I. ii. 435. *R. Mangle* F. I. ii. 459. E. D. R 242.

Forests near the coast, and on banks of large rivers.

Vernac. *Khamo*; *Bhára*, *Bara Goran*.

A tree 25-35 feet high; wood red, hard, splits on seasoning, used only for fuel; fruit said to be edible; bark used in tanning.

DISTRIB.—Tropical shores of Eastern Hemisphere and Australia.

82. *Rhizophora conjugata* Linn.; F. B. I. ii. 436.

Forests near and at the coast, *Heinig & Gammie*!

Vernac. *Khamo*; *Bhára*.

A small tree or large shrub (*vide* F. B. I.); properties unimportant (*vide* E. D.).

DISTRIB.—Tropical shores of Eastern Hemisphere.

Our economic knowledge of the species of *Rhizophora* is singularly incomplete. The present species is excluded from Heinig's list; Clarke correctly includes it as a Sundribun species. It should be noted in passing that Heinig & Gammie, as specimens named by the latter in Herb., Calcutta, show, took the species to be "*R. mucronata*," a circumstance that throws considerable doubt on the accuracy of the F. B. I. statement regarding the size of the tree, and on the justice of the E. D. conclusion as to its want of economic importance.

Both these points, and the further question as to its abundance or otherwise in the Sundribuns, require investigation by local officers.

63. *Cerlops* Arn.

83. *Cerlops Roxburghiana* Arn.; F. B. I. ii. 436. E. D. c 972.

General, especially in the western forests, *Calcutta Garden Collectors*! *T. Thomson*! *Gamble*! *Heinig*! *Prain*! *Lace*!

Vernac. *Gorán*; *Guttia*.

A tree, 12-20 feet high; wood brick-red, hard, used for house-posts and fire-wood; makes excellent charcoal; the bark affords a red dye and is used in tanning.

DISTRIB.—Tropical shores of the Eastern Hemisphere.

Our economic knowledge of the species of *Cerlops* is as inadequate as is that of the species of *Rhizophora*. Both Heinig and Clarke include *C. Candolleana*, as well as *C. Roxburghiana*, in their lists of Sundribun species; on what authority it is difficult to say, since no collector has hitherto sent specimens of *C. Candolleana* to Herb., Calcutta. Heinig, indeed, speaks of *C. Candolleana* as the more important and plentiful of the two; his own specimens, however, as well as those of Gamble distributed under the name *C. Candolleana*, prove on examination to be *C. Roxburghiana*. There is no obvious reasons why *C. Candolleana* should not occur, and under the circumstances it deserves to be carefully looked for; it may be distinguished from the very common *C. Roxburghiana* by its more pointed calyx-segments and its glabrous petals with 3-4 capitate bristles at their emarginate tips. The calyx-lobes of *C. Roxburghiana* are blunter; its concave petals, though glabrous below, are setose-ciliate towards the apex.

64. *Kandelia* W. & A.

84. *Kandelia Rheedei* W. & A.; F. B. I. ii. 437. E. D. K 21.

General, i forests near coast and on banks of the larger rivers.



Vernac. *Goria*.

A tree 20 feet high; wood soft, used in charcoal-making; bark yields a dye.

DISTRIB.—Shores of S.-E. Asia.

### 65. *Bruguiera* Lamk.

Peduncles 1-flowered; calyx-teeth about 12, as long as the tube in the fruiting stage . . . . . *gymnorhiza*.

Peduncles many-flowered; calyx-teeth about 8, much shorter than the tube in the fruiting stage . . . . . *parviflora*.

85. *Bruguiera gymnorhiza* Lamk; F. B. I. ii. 437. *Rhizophora gymnorhiza* F. I. ii. 460. E. D. B 898.

General, in forests near coast and on banks of the larger rivers.

Vernac. *Kankra*.

A tree 40 feet high; wood red-brown, hard, employed for beams, posts, planks, jhools and dabbas of boats, also as fuel; bark used for tanning.

DISTRIB.—Tropical shores of Eastern Hemisphere and Polynesia.

As will be seen in connection with the species that follows our economic knowledge of the *Bruguieras* is as imperfect as our knowledge of *Rhizophora* or *Ceriops*.

86. *Bruguiera parviflora* W. & A.; F. B. I. ii. 438. *Rhizophora parviflora* F. I. ii. 461.

"Delta of the Ganges," Goodlad (1796) *fide* Roxburgh.

A much smaller species than the true *Kankra*; qualities unrecorded, but probably similar to those of the other "Mangroves." Roxburgh's record of the occurrence of this tree in the Sundribuns is very precise, and though it has apparently never been met with in our area since it was obtained by Goodlad in 1796 it deserves to be looked for.

DISTRIB.—Shores of Indo-China and Malaya.

## XXIII.—COMBRETACEÆ.

### 66. *Lumnitzera* Willd.

87. *Lumnitzera racemosa* Willd.; F. B. I. ii. 452. *Petaloma alternifolia* F. I. ii. 372. E. D. L 576.

General, at the sea-face and on river-banks.

Vernac. *Kirpa*; *Kripa*.

A tree, reaching 40 feet in height but usually much smaller; wood hard and durable, withstanding moisture, used for rafters and posts, and as fuel; makes a very good charcoal.

DISTRIB.—Shores of Indo-China; Malaya; N. Australia; Polynesia.

## XXIV.—MYRTACEÆ.

### 67. *Eugenia* Linn.

88. *Eugenia fruticosa* Roxb.; F. I. ii. 487; F. B. I. ii. 499.

Forests, not common, *fide* Heinig.

Vernac. *Ban-jamb*.

A large shrub or small tree; cut for firewood.

DISTRIB.—Assam; Chittagong; Pegu; Tenasserim.

Heinig includes this in his list, but has not sent any specimens. The tree occurs in E. Bengal and there is no reason why it should not extend naturally into the northern forests. At the same time it may belong to the category in which *Bouea burmanica*, *Ægle Marmelos*, *Cassia Fistula*, *Diospyros Embryopteris* ought perhaps to be placed, and may indicate the remains of clearings that at one time existed but that have been re-invaded by forest.

### 68. *Psidium* Linn.

89. \**Psidium* *Guyava* Linn.; F. B. I. ii. 468. *P. pomiferum* F. I. ii. 480. *P. pyriferum* F. I. ii. 480. E. D. P 1343.

Northern clearings, planted.

Vernac. *Piyára*.

A small tree, cultivated for its fruit.

DISTRIB.—Native of America, now cosmopolitan in the Tropics.

### 69. *Barringtonia* Forst.

Calyx valvate; fruit ovoid, when ripe slightly 4-angled near the base  
*racemosa*.

Calyx somewhat imbricate; fruit oblong, fusiform, markedly 4-angled  
throughout *acutangula*.

90. *Barringtonia racemosa* Bl.; F. I. ii. 634; F. B. I. ii. 507.  
E. D. B 193.

Near river-banks, especially in the northern forests, *Calcutta Garden Collectors!* *Heinig!* *Prain!*

Vernac. *Kumia*; *Samandra*.

A tree, reaching 50 feet in height; wood white and soft, only used as fuel.

DISTRIB.—Shores of S.-E. Asia and Polynesia.

91. *Barringtonia acutangula* Gærtn.; F. I. ii 635; F. B. I. ii. 508.  
E. D. B 180.

Northern clearings, *Calcutta Garden Collectors!* also on river-banks, associated with *B. racemosa*, *fide* Heinig.

Vernac. *Hidjal*.

A tree 20-30 feet high; wood hard, reddish, durable but apt to warp and not much used; affords an indifferent tan.

DISTRIB.—S.-E. Asia generally; N. Australia: not a coast species.

Mr. Heinig reports a third species of *Barringtonia*, *B. speciosa* Forst., as associated with *B. racemosa*. The species may be distinguished from the two preceding ones by its entire leaf-margins—in *B. racemosa* and *B. acutangula* the leaf-margins are crenate-denticulate, and by its much larger showy white flowers and very large quadrangular or nearly ovoid fruit. No specimens of

*B. speciosa* have, however, been sent to the Calcutta Herbarium, and its presence in these forests is therefore doubtful. There would be nothing to cause surprise in the existence of *B. speciosa* in the Sundribuns; it should, however, be recollected that in the Andamans and elsewhere the species seems confined to the beach-zone of the littoral forest. It may be looked for along the Sundribun sea-face, but its occurrence associated with *B. racemosa* on river-banks in the northern forests would be at least unusual. The species ought, however, to be carefully searched for.

## XXV.—LYTHRACEÆ.

### 70. *Ammannia* Linn.

#### 92. *Ammannia salicifolia* Monti; F. B. I. ii. 569.

Northern clearings, *Clarke*! *Heinig* & *Gammie*!

Vernac. *Dúd Mari*.

A weed of wet places, properties unimportant.

DISTRIB.—India generally; Trop. Africa.

### 71. *Sonneratia* Linn. f.

Leaves narrow-oblong; calyx 4-lobed; petals 0; stigma very wide-umbellate . . . . . *apetala*.

Leaves oblong or obovate-elliptic; calyx 6-lobed; petals 6; stigma capitate, not very large. . . . . *acida*.

#### 93. *Sonneratia apetala* Ham.; F. I. ii. 506; F. B. I. ii. 579. E. D. S 2369.

Banks of tidal rivers, most plentiful east of the Raimangal.

Vernac. *Kora*.

A gregarious tree, 50-60 feet high; wood reddish-brown, hard, used for indoor planks, furniture, boxes, jhools and dabbas of boats, also for fuel and charcoal. The roots send up vertical blind suckers.

DISTRIB.—Coast of W. India, and of Indo-China.

#### 94. *Sonneratia acida* Linn. f.; F. I. ii. 506; F. B. I. ii. 579. E. D. S 2362.

Banks of rivers, principally in the northern forests.

Vernac. *Ora*.

A gregarious tree; wood soft, grey, only to use as fuel; the fruit is eaten and used as a fish-bait. The roots send up blind suckers.

DISTRIB.—Western India; Indo-China; Malaya; on coasts, and on banks of tidal rivers.

## XXVI.—TURNERACEÆ.

### 72. *Turnera* Linn.

#### 95. *Turnera ulmifolia* Linn.

Northern clearings, *Calcutta Garden Collectors*! *Heinig*!

A small under-shrub, escaped from gardens; has showy yellow flowers but is of no economic importance.

DISTRIB.—Native of America; generally naturalised throughout S.-E. Asia.

## XXVII.—PASSIFLOREÆ.

### 73. *Passiflora* Linn.

#### 96. *Passiflora suberosa* Linn.; F. B. I. ii 599.

Northern clearings, *Calcutta Garden Collectors*!

A common herbaceous climber; properties unimportant.

DISTRIB.—Native of America: very plentiful everywhere, naturalised, in Lower Bengal. First reported from the Sundribuns in 1845.

## XXVIII.—CUCURBITACEÆ.

### 74. *Trichosanthes* Linn.

Bracts of the male flowers small or none; leaves puberulous or pubescent beneath . . . . . *cucumerina*.

Bracts of the male flowers large and sheathing; leaves glabrous beneath . . . . . *palmata*.

#### 97. *Trichosanthes cucumerina* Linn.; F. I. iii. 702; F. B. I. ii. 609 E. D. F 576.

Northern clearings, cultivated and self-sown, *Calcutta Garden Collectors*!

Vernac. *Ban Chichinga*.

A large herbaceous climber; the bitter fruit is often eaten cooked.

DISTRIB.—S.-E. Asia; N. Australia.

#### 98. *Trichosanthes palmata* Roxb.; F. I. ii. 704; F. B. I. ii. 606. E. D. T 600.

Jatta, among ruins, *Prain*!

Vernac. *Makál*.

A large herbaceous climber; fruit when pounded used as an external application in diseases of the ear.

DISTRIB.—S.-E. and E. Asia; N. Australia.

### 75. *Luffa* Cav.

#### 99. *Luffa graveolens* Roxb.; F. I. iii. 716; F. B. I. ii. 614.

Jatta, among ruins, *Prain*!

A herbaceous climber; properties unimportant.

DISTRIB.—E. Himalaya; Tirhut and N. Bengal; Chittagong.

### 76. *Momordica* Linn.

#### 100. *Momordica dioica* Roxb.; F. I. iii. 709; F. B. I. ii. 617. E. D. M 639.

Jatta, among ruins, *Prain*!

A herbaceous climber; fruit and tuberous root sometimes eaten.

DISTRIB.—S.-E. Asia.

## 77. *Cucumis* Linn.

101. *Cucumis trigonus* Roxb.; F. I. ii. 722; F. B. I. ii. 619. E. D. C 2298.

Northern clearings, not uncommon, *Calcutta Garden Collectors*!  
*Prain*!

A herbaceous climber; root tuberous; properties unimportant.

DISTRIB.—Tropical and subtropical Asia.

Whether this is the wild plant from which the cultivated melon has been derived, or is a condition of the melon 'feral by reversion' is not absolutely clear, but, in the writer's opinion, the latter is the more probable explanation of its origin, so far at least as Bengal is concerned.

## 78. *Cephalandra* Schrad.

102. *Cephalandra indica* Naud.; F. B. I. ii. 621. *Momordica monadelpha* F. I. iii. 708. E. D. C 919.

Northern clearings, frequent, *Calcutta Garden Collectors*! *Prain*!  
Vernac. *Bhimbu*; *Tela Kucha*.

A herbaceous climber; fruit eaten cooked when green and fresh when ripe.

DISTRIB.—Tropical Africa; S.-E. Asia.

## 79. *Zehneria* Endl.

103. *Zehneria umbellata* Thw.; F. B. I. ii. 625. *Momordica umbellata* F. I. iii. 710. E. D. Z 182.

Northern forests, *Heinig*!

Vernac. *Kudari*.

A herbaceous climber; fruit sometimes eaten.

DISTRIB.—S.-E. Asia; N. Australia.

## XXIX.—FICOIDEÆ.

### 80. *Sesuvium* Linn.

104. *Sesuvium Portulacastrum* Linn.; F. I. ii. 509; F. B. I. ii. 659. E. D. S 1203.

Locally plentiful on muddy banks, *Calcutta Garden Collectors*!  
*Prain*! Sea-face, plentiful, *Heinig*! *Prain*!

Vernac. *Noona*; *Gangatora-ság*.

An extensively creeping plant; a tolerable mud-binding and an excellent sand-binding species.

DISTRIB.—Cosmopolitan on tropical shores.

81. *Trianthema* Linn.

105. *Trianthema monogyna* Linn.; F. B. I. ii. 660. *T. obcordata*  
F. I. ii. 445. E. D. T 537.

Northern clearings, occasional, *Calcutta Garden Collectors!*  
*Prain!*

A field-weed; properties unimportant.

DISTRIB.—Cosmopolitan in the Tropics.

## COROLLIFLORÆ.

## XXX.—RUBIACEÆ.

82. *Oldenlandia* Linn.

106. *Oldenlandia diffusa* Roxb.; F. I. i. 423; F. B. I. iii. 65.

Northern clearings, not uncommon, *Calcutta Garden Collectors!*  
*Prain!*

A diffuse weed; properties unimportant.

DISTRIB.—S.-E. and E. Asia.

83. *Petunga* DC.

107. *Petunga Roxburghii* DC.; F. B. I. iii. 120. *Randia racemosa*  
F. I. i. 525.

Northern and western forests, *Calcutta Garden Collectors!*  
*Home! Gamble! Heinig!* Eastern forests, *Lace!*

Vernac. *Pitanga*; *Fhijir*; *Narkheli*; *Ban Chár*.

A large shrub or small tree, 15 feet high; wood white, hard, used for making  
boxes and native furniture.

DISTRIB.—Indo-China; Malaya: in swamp-forests.

84. *Vangueria* Juss.

108. *Vangueria spinosa* Roxb.; F. I. i. 536; F. B. I. iii. 136.  
E. D. v 25.

Northern forests, exact locality not given, *Heinig!*

Vernac. *Moyena*.

A large thorny shrub; fruit eaten.

DISTRIB.—India; Indo-China; Malaya.

Possibly an originally introduced species, and one of the group to which  
*Diospyros Embryopteris*, *Cassia Fistula*, *Ægle Marmelos*, *Bouea burmanica*, etc.,  
belong.

85. *Ixora* Linn.

Flowers white, small, in lax branching cymes . . . *parviflora*.

Flowers red, larger, in condensed corymbose cymes . . .  
*coccinea* var. *Bandhuca*.

109. *Ixora parviflora* Vahl; F. I. i. 383; F. B. I. iii. 142. E. D. 1515.

Sea-face, *Heinig & Gammie*!

Vernac. *Rangan*.

An evergreen tree; wood light-brown, hard, close-grained; used for fuel.

DISTRIB.—India and Indo-China.

This species is common in the hotter and drier parts of India and Burma, its presence in the locality where Heinig and Gammie collected it (near Tiger Point) is most probably due to its seeds having been brought down by the great rivers from Upper India.

110. *Ixora coccinea* Linn. VAR. *Bandhuca*; F. B. I. iii. 145. *I. Bandhuca* F. I. i. 376. E. D. 1513.

Northern clearings, planted, *Heinig*!

Vernac. *Rangan*.

A shrub; used largely in native medicine for dysentery, which possibly explains its presence.

DISTRIB.—Indo-China, wild: widely cultivated in S.-E. Asia.

### 86. *Morinda* Linn.

111. *Morinda bracteata* Roxb.; F. I. i. 544. *M. citrifolia* var. *bracteata* F. B. I. iii. 156. E. D. M 656.

River-banks, and sea-face, *Calcutta Garden Collectors*! *Ellis*! *Heinig*! *Lace*!

Vernac. *Bara Chánd*.

A small tree; cut for firewood.

DISTRIB.—Tenasserim and Andamans in the coast-forests, plentiful: elsewhere planted. It extends as a wild shrub along the banks of the Hughli as far north as Calcutta.

## XXXI.—COMPOSITE.

### 87. *Vernonia* Schreb.

112. *Vernonia cinerea* Less.; F. B. I. iii. 233. *Serratula cinerea* F. I. iii. 406. E. D. v 79.

Northern clearings, *Calcutta Garden Collectors*! Jatta, among ruins, *Prain*!

Vernac. *Kák-shim*; *Kalajira*.

A common weed; properties obscure.

DISTRIB.—Tropics of Eastern Hemisphere.

88. *Ageratum* Lian.

113. *Ageratum conyzoides* Linn ; F. B. I. iii. 243. *A. cordifolium*  
F. I. iii. 415.

Northern clearings, at Chandpie only, *Heinig & Gammie*! but there plentiful, *Prairi*!

Vernac. *Oochunti*.

A common weed; properties unimportant.

DISTRIB.—Cosmopolitan in the Tropics: originally American.

89. *Grangea* Forsk.

114. *Grangea maderaspatana* Poir.; F. B. I. iii. 247. *Artemisia maderaspatana* F. I. iii. 412. E. D. G 660.

Northern clearings, *Kurs*! *Heinig & Gammie*!

Vernac. *Namuti*.

A common weed; properties obscure.

DISTRIB.—Tropical and sub-tropical regions of the Eastern Hemisphere.

90. *Conyza* Less.

115. *Conyza semi-pinnatifida* Wall.; F. B. I. iii. 257.

Northern clearings, *Calcutta Garden Collectors*!

A common weed; properties unimportant. This has also been found by Mr. Clarke at Barisal in the Sundribun region east of the Madumati.

DISTRIB.—Assam, Burma; on the banks of large rivers.

91. *Blumea* DC.

116. *Blumea amplexans* DC.; F. B. I. iii. 260; VAR. *maritima*.

Northern clearings, *Kurs*! *Clarke*! *Heinig & Gammie*!

A spreading weed; properties unimportant.

DISTRIB.—India; Indo-China: always near the sea or on the coast.

92. *Pluchea* Cass.

117. *Pluchea indica* Less.; F. B. I. iii. 272. *Coryza corymbosa*  
F. I. iii. 426.

General, in open places.

Vernac. *Munjhú Rukha*; *Kukronda*.

A low shrub; properties unimportant.

DISTRIB.—S. E. Asia: on coasts and in maritime swamps.



93. *Sphæranthus* Linn.

118. *Sphæranthus africanus* Linn.; F. B. I. iii. 275. *S. indicus* F. I. iii. 446 not of Linn.

Northern clearings, very common.

Vernac. *Khatta Palang*.

A coarse weed; properties unimportant.

DISTRIB.—Tropics of Eastern Hemisphere.

94. *Xanthium* Linn.

119. *Xanthium spinosum* Linn.

Banks of Mátla river, abundant, *Calcutta Garden Collectors*!

A spiny weed; properties obscure.

DISTRIB.—Native of S. Europe; recently introduced but now thoroughly established and abundant: so far, not recorded from any other part of India.

95. *Wedelia* Jacq.

Leaves 3-nerved; inner bracts of the involucre bluntish; a considerable climber . . . . . *scandens*.

Leaves not 3-nerved; inner bracts of the involucre distinctly pointed; a prostrate or creeping herb . . . . . *calendulacea*.

120. *Wedelia scandens* Clarke. *W. biflora* F. B. I. iii. 306, not of DC. *Verbesina scandens* F. I. iii. 441.

River-banks and sea-face, climbing over bushes.

A considerable climber; properties unimportant.

DISTRIB.—S.-E. Asia; on coasts.

121. *Wedelia calendulacea* Less.; F. B. I. iii. 306. *Verbesina calendulacea* F. I. iii. 440. E. D. w 25.

Muddy banks; at Baniakhali, *Heinig*! Cheila, *Heinig & Gammie*! Ambaria Khal, *Prain*! Chandpie, *Prain*!

Vernac. *Kesaraj*; *Bhimraj*.

A weed of wet places; properties medicinal, used internally for coughs, externally as a stimulant for growth of hair and in skin diseases; an excellent mud-binding plant.

DISTRIB.—S.-E. and E. Asia.

96. *Cnicus* Linn.

122. *Cnicus arvensis* Hoffm.; F. B. I. iii. 362. *Carduus lanatus* F. I. iii. 408.

Northern clearings, general.

Vernac. *Shial-kanta*.

A common weed ; properties unimportant.

DISTRIB.—N. India ; Himalaya ; N. Asia ; Europe.

### 97. *Launea* Cass.

123. *Launea pinnatifida* Cass. ; F. B. I. iii. 417. *Prenanthes aspleniifolia* F. I. iii. 404 in part.

Sea-face, creeping on sand, *Calcutta Garden Collectors* !

A prostrate herb ; an effective sand-binding species.

DISTRIB.—E. Africa ; Mascarenes ; S.-E. Asia : on sandy sea-shores.

## XXXII.—PLUMBAGINEÆ.

### 98. *Egialitis* R. Br.

124. *Egialitis rotundifolia* Roxb. ; F. I. ii. 111 ; F. B. I. iii. 479. E. D. A 5279.

South-western forests, abundant on edges of creeks, becoming less plentiful towards the east.

Vernac. *Sátári*.

A shrub or small tree ; properties unimportant.

DISTRIB.—W. Indo-China ; Malaya : in mangrove-swamps.

## XXXIII.—MYRSINÆ.

### 99. *Egiceras* Gærtn.

125. *Egiceras majus* Gærtn. ; F. I. iii. 130 ; F. B. I. iii. 533. E. D. A 531.

River-banks and sea-face, very common.

Vernac. *Koilsha* ; *Khalshi* ; *Kulsi*.

A tree, reaching 20 feet in height ; wood hard, only used as fuel.

DISTRIB.—Cosmopolitan on Tropical sea-shores.

## XXXIV.—EBENACEÆ.

### 100. *Diospyros* Linn.

Leaves under 3 in. long, thin, herbaceous or papery, pubescent beneath ; stamens 16 ; fruit glabrous *montana* var. *cordifolia*.

Leaves over 5 in. long, thick, coriaceous, glabrous ; stamens 24 or more ; fruit glandular or rusty-pubescent. *Embryopteris*.

126. *Diospyros montana* Roxb. ; F. B. I. iii. 555 : VAR. *cordifolia*, *D. cordifolia* F. I. ii. 538. E. D. D 628.

Jatta, among ruins, *Prain* !

Vernac. *Ban Gáb*.

A small to medium tree; wood yellowish grey; soft but durable.

DISTRIB.—S.-E. Asia; N. Australia: here most probably a tree originally introduced. This is almost certainly specifically distinct from *D. montana*.

- 127 *Diospyros Embryopteris* Pers. F. B. I. iii. 556. *D. glutinosa*  
F. I. ii. 533. E. D. D 582.

Mandabari ruins, *Heinig*; Jatta, among ruins, *Prain*! Eastern  
Forests, *Lace*! *Heinig*.

Vernac. *Gáb*; *Makurkendi*.

An evergreen tree, reaching 60 feet in height. Wood white, hard; used for building, for masts and yards, and as fuel; the viscid pulp of the fruit is used to pay the seams of boats and to strengthen nets and cordage; it is full of tannin and is used in native medicine as an astringent; fruit also eaten.

DISTRIB.—S.-E. Asia.

As *Heinig* had not communicated specimens of this tree, which is stated in his list to be found in the reserved forests, but not to be common, and as the writer only met with it at Jatta it appeared possible that this might be only a survival, in all its localities, of abandoned settlements like that of Jatta. Consulted on the subject, *Heinig* has informed the writer that there are some fine *Gáb* trees (*Diospyros Embryopteris*) on the mounds or platforms of higher ground left by the old salt-makers or dacoits on the left bank of the Mandabari river. The properties of the *Gáb*, as will be seen, are just such as would lead to its having been planted by people of the class who once occupied these ruins. During a visit to the Sundribuns paid by *Lace* in January, 1903, it was, however, found that this *Diospyros* does occur in the swamp-forests in places where former settlement is not conceivable so that *Heinig*'s record is already quite confirmed.

### XXXV.—SALVADORACEÆ.

#### 101. *Azima* Lamk.

128. *Azima tetracantha* Lamk.; F. B. I. iii. 620. E. D. A 1165.

Western river-banks and sea-face, *Calcutta Garden Collectors*!

Vernac. *Trikanta Gati*.

A thorny shrub; properties unimportant.

DISTRIB.—S. India; Mascarenes; S. Africa.

### XXXVI.—APOCYNACEÆ.

#### 102. *Cerbera* Linn.

129. *Cerbera Odollam* Gærtn; F. I. i. 692; F. B. I. iii. 638.

River-banks everywhere, fairly common.

Vernac. *Dákur*; *Dábur*; *Láko*.

A small tree, sometimes reaching 40 feet in height; wood white, soft, useless; seed yields an illuminating oil.

DISTRIB.—S.-E. Asia; Australia; Polynesia: in maritime swamps.

103. *Parsonsia* R. Br.130. *Parsonsia spiralis* Wall. ; F. B. I. iii. 650.General, *Heinig* ! *Heinig & Gammie* ! *Prain* !

A large climber ; properties unimportant.

DISTRIB.—S.-E. Asia.

## XXXVII.—ASCLEPIADACEÆ.

104. *Hemidesmus* R. Br.131. *Hemidesmus indicus* R. Br. ; F. B. I. iv. 5. *Asclepias pseudo-*  
*sarsa* F. I. ii. 39. E. D. H 119.Northern forests, *Heinig* ! Jatta, *Prain* !Vernac. *Ananta-mal*.

A twining shrub ; root medicinal.

DISTRIB.—India generally and Ceylon.

105. *Finlaysonia* Wall.132. *Finlaysonia obovata* Wall. ; F. B. I. iv. 7.

Everywhere, rather common.

Vernac. *Dudhi-lata*.

A lofty climber ; stems twisted into ropes.

DISTRIB.—Shores of Indo-China and Malaya.

106. *Oxystelma* R. Br.133. *Oxystelma esculentum* R. Br. ; F. B. I. iv. 17. *Asclepias rosea*  
F. I. ii. 40. E. D. O 600.Kagdip, *Calcutta Garden Collectors* !Vernac. *Dudhia-lata*

A slender glabrous twiner ; properties obscure.

DISTRIB.—India ; Indo-China ; Malaya.

107. *Calotropis* R. Br.134. *Calotropis gigantea* R. Br. ; F. B. I. iv. 17. *Asclepias gigantea* F. I. ii. 30. E. D. C 170Northern clearings, apparently very rare, only a few plants observed at Rampura, *Prain* ! Sea-face at Tiger Point, plentiful, *Lace* !Vernac. *Akanda* ; *Gurtákand* ; *Madár*.

An erect spreading shrub ; yields a fibre used for fishing lines ; also a dye ; the sap affords an inferior "Gutta" and is medicinal.

DISTRIB.—S. E. Asia.

108. *Pentatropis* R. Br.

135. *Pentatropis microphylla* W. & A.; F. B. I. iv. 20. *Asclepias microphylla* F. I. ii. 35. E. D. P 396.

Skirts of northern clearings, climbing over bushes, *Calcutta Garden Collectors! Clarke!*

A small twiner; properties obscure.

DISTRIB.—India; Indo-China.

109. *Dæmia* R. Br.

136. *Dæmia extensa* R. Br.; F. B. I. iv. 20. *Asclepias echinata* F. I. ii. 44. E. D. D. 9.

Canning Town only, but there plentiful, on banks of Mátla river, *Calcutta Garden Collectors! Prain!*

Vernac. *Chhagal Bati*.

A foetid weedy climber; yields a fair fibre; said to be medicinal.

DISTRIB.—India generally; Afghanistan.

This is one of the usual constituents of the "village shrubberies" characteristic of Lower Bengal; in India it accompanies man as a weed.

110. *Sarcolobus* Wall.

Corolla white with a purplish tinge, lobes pubescent within; fruit large, globose, greyish-brown, coriaceous, not winged. . . . *globosus*,  
Corolla yellow with lines of brownish purple dots, nearly glabrous within; fruit small, ellipsoid, yellow, chartaceous, with longitudinal wing-like ridges . . . . . *carinatus*.

137. *Sarcolobus globosus* Wall. F. B. I. iv. 27.

Everywhere common, especially on river-banks, from the northern clearings to the sea.

Vernac. *Baoli-lata*; *Baoli-phal*.

A large climber; juice said by wood-cutters to be unwholesome.

DISTRIB.—Coasts of Indo-China and Malaya.

Heinig in his list states:—"The kernel of the ripe fruit is eaten." As the ripe fruit is filled with numerous subdiscoid seeds, there seemed to be here some mistake. Among Heinig's specimens is one of a plant termed "*Baoli-phal*," collected at Nalkora, regarding which he has noted "fruit eaten": unfortunately "*Baoli-phal*" has only leaves in a young condition, and the matter could not be satisfactorily settled. Recently, however, some Sundribun fishermen have brought fruiting specimens and have explained that they term the fruits "*Baoli-phal*" and eat the seeds, as well as the inside of the pericarp.

138. *Sarcolobus carinatus* Wall.; F. B. I. iv. 28.

Skirts of northern clearings and northern forests, common; not met with in the central or southern reserves.

Vernac. *Baoli-lati* (*fide Heinig*).

A small twiner; properties unimportant.

DISTRIB.—Coasts of W. Indo-China.

### 111. *Dregea* E. Mey.

139. *Dregea volubilis* Benth.; F. B. I. iv. 46. *Asclepias volubilis*  
F. I. ii. 36.

River-banks in Eastern forests, *Lace*!

Vernac. *Tita Kunja*.

A stoutish twiner; properties obscure.

DISTRIB.—Throughout India; Ceylon; Malaya.

### 112. *Tylophora* R. Br.

140. *Tylophora tenuis* Bl.; F. B. I. iv. 42. *Asclepias tenuissima*  
F. I. ii. 41.

Northern clearings and skirts of northern forests, very plentiful,  
*Kurz*! *Clarke*! *Prain*!

A slender prostrate or twining herb; properties obscure, said to be medicinal.

DISTRIB.—S.-E. Asia.

### 113. *Dischidia* R. Br.

141. *Dischidia Nummularia* R. Br.; F. B. I. iv. 49.

Bagirhat Reserve forests, epiphytic, *Heinig*!

Vernac. *Pargátcha*.

A small epiphytic twiner, rooting at the nodes; properties obscure.

DISTRIB.—Indo-China; Malaya; N. Australia.

### 114. *Hoya* R. Br.

142. *Hoya parasitica* Wall.; F. B. I. iv. 57. *Asclepias parasitica*  
F. I. ii. 42.

Everywhere throughout the forests, on trees; often very plentiful.

Vernac. *Pargátcha*.

A stout epiphytic climber; properties obscure; flowers waxy, sweet-scented.

DISTRIB.—Indo-China; Malaya.

## XXXVIII.—GENTIANACEÆ.

### 115. *Hoppea* Willd.

143. *Hoppea dichotoma* Willd.; F. B. I. iv. 100. *Pladera pusilla*  
F. I. i. 403.

Northern clearings, locally abundant, *Heinig & Gammie!*  
*Calcutta Garden Collectors! Prain!*

A small herb; properties unimportant.

DISTRIB.—India generally; Assam; Chittagong.

**116. *Limnanthemum* S. P. Gmel.**

144. *Limnanthemum cristatum* Griseb.; F. B. I. iv. 131. *Menyanthes cristata* F. I. i. 459.

Northern clearings, occasional, *Prain!*

Vernac. *Pan-chuli; Chand Malla.*

A floating aquatic; properties obscure.

DISTRIB.—India; Indo-China; S. China.

**XXXIX.—HYDROPHYLLACEÆ.**

**117. *Hydrolea* Linn.**

145. *Hydrolea zeylanica* Vahl; F. B. I. iv. 133. *Nama zeylanica* F. I. ii. 73. E. D. H 504.

Northern clearings, *Heinig & Gammie! Calcutta Garden Collectors!*

Vernac. *Kasschra; Isha-langulia.*

A procumbent herb; properties obscure.

DISTRIB.—Cosmopolitan in the Tropics.

**XL.—BORAGINÆÆ.**

**118. *Cordia* Linn.**

146. *Cordia Myxa* Linn.; F. I. i. 590; F. B. I. iv. 136. E. D. C 1931.

Chandpie, *Prain!*

Vernac. *Bohnari; Lashora.*

A medium tree; wood grey, only moderately hard, but durable and seasoning well, though liable to attacks by insects; fruit medicinal, mainly demulcent.

DISTRIB.—N. Africa; Tropical Asia; N. Australia; but often planted, as is the case in this instance.

**119. *Coldenia* Linn.**

147. *Coldenia procumbens* Linn.; F. I. i. 448; F. B. I. iv. 144. E. D. C 1717.

Sundribuns, *Clarke.*

A prostrate scabrous annual weed; properties obscure.

DISTRIB.—Cosmopolitan in the Tropics.

This species is included in Mr. Clarke's Sundribun list: there is no Sundribun specimen in the Calcutta Herbarium. It may be looked for in the Eastern

Sundribuns (Backerganj District) and in the northern clearings. The plant has alternate crisped leaves and usually lies quite flat on the ground.

### 120. *Heliotropium* Linn.

148. *Heliotropium indicum* Linn.; F. I. i. 454; F. B. I. iv. 152

E. D. H 102.

Suta Khal, in clearing, not common, *Prain*!

An annual herb, mostly on waysides and in waste-places, rarely in fields; properties unimportant.

DISTRIB.—Cosmopolitan in the Tropics.

Mr. Clarke's list of Sundribun plants includes also *Heliotropium ovalifolium*. This species is not present from the Sundribuns in the Calcutta Herbarium; it should be looked for in the northern and eastern clearings.

## XLI.—CONVOLVULACEÆ.

### 121. *Stictocardia* Hallier f.

149. *Stictocardia tiliæfolia* Hallier f. *Argyreia tiliæfolia* F. B. I. iv. 184. *Convolvulus gangeticus* F. I. i. 467

Banks of tidal rivers in western parts, *Kurz*! *Calcutta Garden Collectors*! Sea-face, *Heinig*!

A twining or climbing shrub; properties unimportant.

DISTRIB.—S.-E. Asia.

### 122. *Merremia* Dennst.

150. *Merremia hederacea* Hallier f. *Ipomœa polyantha* F. B. I. iv. 206.

Eastern Sundribuns, *Clarke*!

A twining shrub; properties unimportant.

DISTRIB.—Malaya.

### 123. *Ipomœa* Linn.

Flowers large, white; leaves ovate-cordate entire; seeds shaggy with long hairs along the angles; climbing . . . *longiflora*.  
Flowers purple or, if whitish or pale-purple, with at least a dark purple eye:—

Leaves palmately 5-7-lobed; seeds shaggy with long hairs along the angles; climbing . . . *paniculata*.

Leaves not palmately or digitately lobed:—

Leaves orbicular, obtuse or emarginate or 2-lobed; seeds villous, but not shaggy with long hairs along the angles; plant creeping in sand . . . *Pes-capræ*.

Leaves acute or acuminate at the tip:—

Floating on water or rooting in mud at edges of ponds; leaves elliptic, oblong-cordate or hastate, sometimes



. slightly lobed ; seeds finely silky but not shaggy along the margins . . . . . *reptans*.

Climbing over bushes or trees ; leaves ovate-cordate :—

Leaves entire ; a heavy creeper with large pink-purple flowers ; seeds shaggy with long hairs along the angles . . . . . *illustris*.

Leaves more or less lobed ; a light creeper with pale-purple or sometimes nearly white flowers but with always a dark-purple eye ; seeds furred but not shaggy along the angles, *sepiaria* var. *stipulacea*.

151. *Ipomœa longiflora* R. Br. *I. grandiflora* F. B. I. iv. 198.

Sea-face, *Heinig*!

A large climber ; properties unimportant.

DISTRIB.—Coasts of S.-E. Asia ; Australia ; New Caledonia ; Polynesia.

152. *Ipomœa paniculata* R. Br. *I. digitata* F. B. I. iv. 202.

*Convulvulus paniculatus* F. I. i. 478. E. D. i 379.

Northern forests, *Prain*!

Vernac. *Bilai-kand* ; *Bhui-kumra*.

A large climber ; roots medicinal.

DISTRIB.—Cosmopolitan in the Tropics.

153. *Ipomœa Pes-capræ* Sweet *I. biloba* F. B. I. iv. 212. *Convulvulus Pes-capræ* F. I. i. 485. E. D. i 362.

Sea-face, very common.

Vernac. *Chhagal-kuri*.

A prostrate herb ; an excellent sand-binding species.

DISTRIB.—Cosmopolitan in the Tropics.

154. *Ipomœa reptans* Poir. *I. aquatica* F. B. I. iv. 210. *Convulvulus repens* F. I. i. 432. E. D. i 343.

Northern clearings, occasional, *Calcutta Garden Collectors*!

Vernac. *Kalmi Sâk*.

A floating aquatic ; used as a vegetable.

DISTRIB.—Tropics of Eastern Hemisphere and Australia.

155. *Ipomœa illustris* Prain. *I. campanulata* var. *illustris*, F. B. I. iv. 211.

Sea-face, *Heinig*! Cheila Bogi river, *Heinig & Gammie*! Pussar and Ambaria rivers, *Prain*! Eastern river-banks, *Lace*!

A large climber with handsome flowers ; properties unimportant.

DISTRIB.—W. Indo-China ; Malaya : on coasts.

156. *Ipomœa sepiaria* Kœn. VAR. *stipulacea* F. B. I. iv. 209. *Convulvulus stipulaceus* F. I. i. 484.

Very common on the skirts of the northern forests and in the northern clearings.

Vernac. *Ban Kalmi*.

A slender climber; properties unimportant.

DISTRIB.—Lower Bengal; Chittagong.

#### 124. *Cuscuta* Linn.

157. *Cuscuta reflexa* Roxb.; F. I. i. 446; F. B. I. iv. 225. E. D. C 2508.

Northern clearings and skirts of northern forests, *Calcutta Garden Collectors*! In central forests only noticed in one place, *Prain*.

Vernac. *Alag-lata*.

A parasitic leafless twiner; whole plant used in native medicine.

DISTRIB.—S.-E. Asia.

### XLII.—SOLANACEÆ.

#### 125. *Solanum* Linn.

Flowers white, small; leaves green on both sides, glabrous; plants without prickles . . . . . *nigrum*.

Flowers blue:—

Plants without prickles; leaves very white beneath *argenteum*.

Plants armed with prickles; leaves green:—

Spines long, straight; berry large, half an inch or more across; prostrate herbs . . . . . *xanthocarpum*.

Spines short, recurved; berry rather small, one-third inch or less across; scandent under-shrubs . . . . . *trilobatum*.

158. *Solanum nigrum* Linn.; F. B. I. iv. 229. *S. rubrum* F. I. i. 565. E. D. s 2299.

Northern clearings, rare, *Prain*!

Vernac. *Gurkhi*; *Gurkamai*.

A small under-shrub or herb; whole plant used in native medicine.

DISTRIB.—Cosmopolitan in temperate, sub-tropical and tropical regions.

159. *Solanum argenteum* Dun.

Abundant and thoroughly naturalized on banks of Mátla river, near Canning Town; *Calcutta Garden Collectors*! *Prain*!

A shrub, occasional in gardens; here wild and thoroughly established; properties obscure.

DISTRIB.—Native of S. America: here an escape.

160. *Solanum xanthocarpum* Schrad. & Wendl.; F. B. I. iv. 236.

*S. diffusum* F. I. i. 568. *S. Jacquini* F. I. i. 569. E. D. s 2345.

Banks of Mátla river at Canning Town, *Prain*!

A diffuse very prickly herb; root and fruit reputed medicinal.

DISTRIB.—S.-E. Asia; Australia; Polynesia.

161. *Solanum trilobatum* Linn.; F. I. 571; F. B. I. i 236. E. D. s 2315.

General in the northern and western forests on river-banks and skirts of clearings.

A scandent under-shrub; root, leaves and fruit reputed medicinal.

DISTRIB.—S.-E. Asia: in or near tidal swamps.

### XLIII.—SCROPHULARINEÆ.

#### 126. *Angelonia* H. & B.

162. *Angelonia grandiflora* C. Morr.

Kagdip, rather common, *Prain*!

A "garden escape," though there are no gardens at Kagdip except that of the forest office, within which the species did not happen to occur. The same plant has been found by Kurz similarly established in places in the Irrawaddy Delta: the present is the first record of the species, other than as a garden plant, from Bengal.

DISTRIB.—Native of S. America.

#### 127. *Limnophila* R. Br.

163. *Limnophila gratissima* Bl.; F. B. I. iv. 268.

Jatta, margin of the old temple tank, *Prain*!

An aquatic or marsh weed; properties unimportant.

DISTRIB.—S.-E. Asia.

#### 128. *Herpestis* Gært. f.

164. *Herpestis Monnieria* H. B. K.; F. B. I. iv. 272. *Gratiola Monnieria* F. I. i. 141. E. D. H 149.

Northern clearings, general.

Vernac. *Adha Birni*.

A weed of marshy places; properties obscure.

DISTRIB.—Cosmopolitan in the Tropics.

#### 129. *Vandellia* Linn.

165. *Vandellia crustacea* Benth.; F. B. I. iv. 279. *Torenia varians* F. I. iii. 96.

Northern clearings, occasional.

A weed of fields and waste places; properties unimportant.

DISTRIB.—Tropics of Eastern Hemisphere.

#### 130. *Scoparia* Linn.

166. *Scoparia dulcis* Linn.; F. B. I. iv. 289.

Chandpie only, *Heinig & Gammie*! but there quite abundant, *Prain*!

An under-shrub ; twigs used as tooth-brushes.

DISTRIB.—Native of America, now widespread in the Eastern Hemisphere and Australia.

#### XLIV.—LENTIBULARIACEÆ.

##### 131. *Utricularia* Linn.

Peduncles with a whorl of oblong vesicles about the middle

*stellaris.*

Peduncles naked or with a few obscure scales

*flexuosa.*

167. *Utricularia stellaris* Linn. f. ; F. I. i. 143 ; F. B. I. iv. 328.

Ponds in northern clearings, rare.

Vernac. *Thangi.*

A floating aquatic ; properties unimportant.

DISTRIB.—Tropics of Eastern Hemisphere and N. Australia.

168. *Utricularia flexuosa* Vahl ; F. B. I. iv. 329. *U. fasciculata* F. I. i. 143.

Ponds in northern clearings.

Vernac. *Thangi.*

A floating aquatic ; properties unimportant.

DISTRIB.—S.-E. Asia ; N. Australia.

#### XLV.—BIGNONIACEÆ.

##### 132. *Dolichandrone* Seem.

169. *Dolichandrone Rheedei* Seem. ; F. B. I. iv. 379. E. D. D 753.

General, but never common, from the northern forests down to the coast, *Heinig ! Prain !*

Vernac. *Gorshingiah.*

A tree, height 50 feet ; wood white, soft, brittle ; an indifferent fuel.

DISTRIB.—S.-E. Asia.

#### XLVI.—ACANTHACEÆ.

##### 133. *Hygrophila* R. Br.

Unarmed herbs ; calyx 5-toothed :—

Leaves lanceolate ; capsule much longer than the calyx

*quadrivalvis.*

Leaves obovate ; capsule hardly longer than the calyx

*phlomoides* var. *Roxburghii.*

Spinescent herbs ; calyx 4-partite ; leaves lanceolate

*spinosa.*

170 *Hygrophila quadrivalvis* Nees ; F. B. I. iv. 408.

Chandpie, *Heinig & Gammie !*

A weed of marshy places ; properties obscure.

DISTRIB.—India ; Malaya ; Indo-China.

171. *Hygrophila philomoides* Nees VAR. *Roxburghii* F. B. I. iv. 408.

*Ruellia obovata* F. I. iii. 51.

Common in the northern parts, *Hooker ! Clarke ! Kurz ! Prain !*

A weed of marshy places ; properties obscure.

DISTRIB.—Sub-Himalayan region ; Bengal ; Indo-China.

172. *Hygrophila spinosa* T. And. ; F. B. I. iv. 408. *Ruellia longifolia* F. I. iii. 50. E. D. H 508.

Northern clearings, common.

Vernac. *Kanta Kalika ; Kulia Khara.*

A spinous weed of wet places ; properties obscure.

DISTRIB.—India generally : Andamans, but there probably introduced.

### 134. *Hemigraphis* Nees.

173. *Hemigraphis hirta* T. And. ; F. B. I. iv. 422. *Ruellia hirta* F. I. iii. 46.

Northern clearings, very rare, *Prain !*

A prostrate weed ; properties unimportant.

DISTRIB.—Gangetic Plain generally.

### 135. *Acanthus* Linn.

Leaves spinous ; bracteoles broad ; corolla blue ; stems erect

*ilicifolius.*

Leaves unarmed ; bracteoles 0 ; corolla white with a yellowish tinge ; climbing . . . . . *volubilis.*

174. *Acanthus ilicifolius* Linn. ; F. I. iii. 32 ; F. B. I. iv. 481. E. D.

A 324.

Everywhere on river-banks and in low swampy places within the forests.

Vernac. *Hargosa ; Kintki.*

An under-shrub ; an excellent mud-binding species.

DISTRIB.—S.-E. Asia and N. Australia : on coasts.

Heinig reports from the western forests another species with spinous leaves, *A. ebracteatus*, but no specimens of this have reached the Calcutta Herbarium. It should be looked for ; it differs from *A. ilicifolius* in having no bracteoles.

175. *Acanthus volubilis* Wall. ; F. B. I. iv. 481.

River-banks in the western forests, very rare, *Wallich ! Calcutta Garden Collectors ! Heinig !*

A climbing under-shrub ; properties unimportant.

DISTRIB.—Indo-China ; Malaya : on coasts.

## XLVII.—VERBENACEÆ.

136. *Lantana* Linn.

Leaves usually in whorls of 3, sometimes opposite; branches covered throughout with spreading hairs . . . . . *trifolia*.

Leaves usually opposite, sometimes in whorls of 3; branches scabrid with adpressed hairs . . . . . *indica*.

176. *Lantana trifolia* Linn.; F. B. I. iv. 563.

Eastern Sundribuns, at Barisal, *Clarke*!

A shrub, 3-8 feet high; a common weed on banks of rivers and creeks, of no economic importance. Though never yet recorded from the country between the Madumati and the Hughli, there is much likelihood that it occurs there; it ought to be searched for. Another reason for calling attention to the plant is the difficulty there is in distinguishing it from *Lantana indica*, and the further difficulty in distinguishing either of these *Lantanas* from *Lippia geminata*. The present is an American species, somewhat recently introduced to India.

177. *Lantana indica* Roxb.; F. I. iii 89; F. B. I. iv. 562.

Northern clearings, apparently very rare, *Calcutta Garden Collectors*!

A shrub 3-8 feet high; of no economic importance: exceedingly like the preceding species which is often only to be distinguished by its spreading pubescence. Though very common in Lower Bengal, outside the Sundribun area, it seems to have barely yet established itself in Sundribun clearings.

DISTRIB.—India generally; Beluchistan; Tropical Africa.

137. *Lippia* Linn.

Perennial, erect, softly strigose shrubs; leaves ovate-oblong, cre-nate; peduncles mostly opposite; bracts ovate-acuminate

*geminata*.

Annual, creeping, minutely hairy herbs; leaves cuneate-spathulate, serrate; peduncles rarely opposite; bracts obovate-acute

*nodiflora*.

178. *Lippia geminata* H. B. & K; F. B. I. iv. 563.

Northern clearings, rare, *Heinig*!

A shrub 3-8 feet high; of no economic importance: resembles *Lantana indica* even more closely than *Lantana trifolia* sometimes does, and when in flower often hardly distinguishable. When in fruit *Lippia geminata* is recognised by its fruit separating into two 1-seeded pyrenes; the fruits of the two *Lantanas* remain entire and contain the two 1-seeded pyrenes. In the Gangetic Plain north of the Sundribuns this is even more common than *Lantana indica*, but like that species has as yet hardly established itself in the Sundribun clearings.

DISTRIB.—E. Bengal: native of America.

179. *Lippia nodiflora* Rich.; F. B. I. iv. 563. E. D. L 451.

Common in every clearing; occasional in suitable localities (upper margins of mud-banks) throughout the forests; also at the sea-face.

Vernac. *Bhui Okra*.

A prostrate herb; an excellent sand-binding and still more effective mud-binding species.

DISTRIB.—Cosmopolitan in tropical and sub-tropical regions.

### 138. *Premna* Linn.

180. *Premna integrifolia* Linn.; F. I. iii. 81; F. B. I. iv. 574. *P. serratifolia* F. I. iii. 77. *P. spinosa* F. I. iii. 77. E. D. p. 1233.

River-banks, widely spread from the northern clearings to the sea, but not plentiful except at the sea-face, *Calcutta Garden Collectors! Gamble! Ellis! Prain!*

Vernac. *Goniari*; *Bhut Biravi*.

A shrub or small tree; wood white with reddish streaks, moderately hard; used as fuel.

DISTRIB.—Coasts of S.-E. Asia; E. Africa.

### 139. *Vitex* Linn.

Leaves 3-foliolate, and occasionally 1-foliolate; leaflets without petiolules, obovate and obtuse . . . . . *trifolia*.

Leaves 5-foliolate, and occasionally 3-foliolate; leaflets with distinct petiolules, lanceolate and acute . . . . . *Negundo*.

181. *Vitex trifolia* Linn. f.; F. I. iii. 69; F. B. I. iv. 583. E. D. v. 181.

Sea-face to the east of the river Madumati.

Vernac. *Pani Sanbhalu*.

A small deciduous tree or large shrub; wood greyish-white, hard; used as fuel.

DISTRIB.—S.-E. Asia; N. Australia.

Though this has not yet been recorded from the central or western Sundribuns, it grows in similar situations to *V. Negundo* in a locality so adjacent that there is no reason why it should not occur. The species should, therefore, be looked for. It is exceedingly like, and might easily be casually mistaken for, *V. Negundo*.

182. *Vitex Negundo* Linn.; F. I. iii. 70; F. B. I. 583. E. D. v. 164.

Sea-face at Tiger Point and elsewhere, plentiful, *Heinig! Prain!*

Vernac. *Sanbhalu*; *Niskinda*.

A deciduous small tree or large shrub; wood greyish-white, hard; used as fuel.

DISTRIB.—S.-E. Asia; Afghanistan.

### 140. *Clerodendron* Linn.

Corolla irregularly salver-shaped, never exceeding an inch in length; panicles axillary:—

Leaves obovate or elliptic, sub-obtuse, opposite or very rarely in whorls of 3; calyx in fruit closely applied to the base of the berry  
*inermis*.

Leaves elliptic, acute, or linear-oblong, generally in whorls of 3 ;  
calyx in fruit somewhat spreading, the fruit considerably larger  
*neriifolium*.

Corolla narrowly funnel-shaped, never less than 3 inches in length ;  
panicle terminal ; leaves narrowly lanceolate . *Siphonanthus*.

183. *Clerodendron inerme* Gærtn. ; F. I. iii. 58 ; F. B. I. iv. 589. E. D.  
C 1377.

Common on river-banks everywhere from the northern clearings to  
the sea, occasionally also in the forests.

Vernac. *Ban-jai* ; *Ban-jám* ; *Ban-jumet* ; *Ban-modi* ; *Butráj*.

An under-shrub ; used as fuel.

DISTRIB.—India ; Indo-China : on coasts.

184. *Clerodendron neriifolium* Wall. ; F. B. I. iv. 589. *Volkameria*  
*neriifolia* F. I. iii. 64.

Sea-face, apparently very rare, *Heinig* !

An under-shrub ; used as fuel.

DISTRIB.—Indo-China ; Malaya ; Philippines ; Australia ; China : on coasts.

185. *Clerodendron Siphonanthus* R. Br. ; F. B. I. iv. 595. *Sipho-*  
*nanthus indica* F. I. iii. 67 ; E. D. C 1394.

Reserved forests, associated with *C. inerme*, *fide Heinig*.

Vernac. *Bámanhatti*.

A shrub, soft-wooded, useless.

DISTRIB.—S.-E. Asia : often planted.

This is given by *Heinig* in his list, but as no specimens of the plant have  
been sent, the record requires verification. It is possibly a plant of the same  
category as *Bouea*, *Cassia Fistula*, *Diospyros Embryopteris*, *Ægle*, etc.

#### 141. *Avicennia* Linn.

Leaves obovate or elliptic obtuse, yellowish beneath ; capsule  
broadly oblong obtuse . . . . . *officinalis*.

Leaves lanceolate acute, white beneath ; capsule narrowly conical,  
acute . . . . . *alba*.

186. *Avicennia officinalis* Linn. ; F. B. I. iv. 604. *A. tomentosa* F. I.  
iii. 88. E. D. A 1661.

Common everywhere from the northern borders to the sea-face.

Vernac. *Báen* ; *Bani* ; *Bina*.

A large timber-tree 40-60 feet high ; wood dark-grey, hard, used for plank-  
ing, beams, drain-pipes, sluices, oil-mills, jhools and dabbas of boats, and for fuel ;  
exudes a gum applied to ulcers. The roots send up soft and pith-like blind root-  
suckers.

DISTRIB.—S.-E. Asia ; N. Australia ; Polynesia.

This is one of the tallest and is much the thickest of Sundribun species ;  
the stems of old trees are very apt to become hollow. The structure of the wood



is somewhat peculiar, in that the fibres of any particular ring of growth do not pass vertically upwards, but instead diverge "herring-bone fashion" from an indistinct vertical linear raphe, which appears to correspond to the plane of an original branch, at an angle of about 15°, their upper ends blending in a much less definite raphe midway between two raphes of divergence. The raphes of divergence of the ring of growth next above and next below any particular ring alternate, so that in weathered trunks and to a less extent in freshly cut sound logs, a lace-work arrangement of the fibres of the various rings of growth presents itself. This configuration and arrangement is to be observed also in the bark of the *Bakayan*, where it is more immediately patent, though perhaps less definite.

The wood-cutters speak of the existence of four distinct Báens: so far as could be gathered one of these is *Avicennia alba*, Dudhi Báen, with acute leaves and narrow sharp-pointed capsules, which is certainly a very distinct species. The other three have obtuse leaves and broad capsules and are all apparently forms of the present species. The three forms are (1) the tree, 40-60 feet high, with a girth of 12-15 feet, which has sometimes ovate-obtuse, sometimes oblong-obtuse leaves; (2) the shrub or small tree with broader ovate-obtuse leaves; (3) the shrub or small tree with narrower oblong-obtuse leaves. These three are, however, only distinguishable by the characters indicated and exhibit no botanically distinctive characters.

87. *Avicennia alba* Bl. *A. officinalis* var. *alba* F. B. I. iv. 604. E. D. 5665.

River-banks, very rare; at Malanchi, *Lace & Prain*! Nalkhora, *Prain*!

Vernac. *Dudhi Báen*.

A small shrub; used as firewood.

DISTRIB.—Coasts of W. India; Indo-China; Malaya; N. Australia.

## XLVIII.—LABIATÆ.

### 142. *Ocimum* Linn.

Pedicels of individual flowers as long as calyx . . . *sanctum*.

Pedicels of individual flowers shorter than the calyx . . . *Basilicum*.

188. *Ocimum sanctum* Linn.; F. I. iii. 14; F. B. I. iv. 609. E. D. 0

31.

Chandpie, *Heinig & Gammie*! Jatta, among ruins, *Prain*!

Vernac. *Túlsi*.

A herb or under-shrub; sacred.

DISTRIB.—Orient; S.-E. Asia; Australia; Polynesia.

189. *Ocimum Basilicum* Linn.; F. I. iii. 17; F. B. I. iv. 609. *O. pilosum* F. I. iii. 16. E. D. 0 18.

Rampura, *Prain*!

Vernac. *Babui Túlsi*.

A herb or under-shrub: medicinal, and used as a flavouring in cookery.

DISTRIB.—Tropics of Eastern Hemisphere; Polynesia.

143. *Anisomeles* R. Br.

190. *Anisomeles ovata* R. Br.; F. B. I. iv. 672: VAR. *mollissima*.  
*Ajuga disticha* F. I. iii. 2. E. D. A 1136.

Jatta, among ruins, *Prain*!

Vernac. *Gobura*.

A coarse annual herb; properties obscure.

DISTRIB.—S.-E. Asia.

144. *Leucas* R. Br.

191. *Leucas linifolia* Spreng.; F. B. I. iv. 690. *Phlomis seylanica* F. I. iii. 9. E. D. L 323.

Northern clearings, common.

Vernac. *Hal-kúsa*; *Guma*.

A herb; properties obscure.

DISTRIB.—Mauritius; S.-E. Asia.

## INCOMPLETÆ.

## XLIX.—AMARANTACEÆ.

145. *Amarantus* Linn.

Bracts awned, recurved, longer than the sepals; sepals 5; stamens 5  
*paniculatus*.

Bracts acute but hardly awned, shorter than the sepals; sepals 3;  
 stamens 3:—

Clusters of flowers both terminal and axillary; utricle with an  
 acute tip . . . . . *viridis*.

Clusters of flowers, all axillary; utricle blunt *polygamus*.

192. \**Amarantus paniculatus* Linn.; F. B. I. iv. 718. *A. frumentaceus* F. I. iii. 610. E. D. A 925.

Canning Town, *Calcutta Garden Collectors*!

A large herb, 4-5 feet high; cultivated as a pot-herb.

DISTRIB.—Trop. Africa and Asia.

193. *Amarantus viridis* Linn.; F. I. iii. 605; F. B. I. iv. 720.  
 E. D. A 953.

Kagdip, *Prain*!

Vernac. *Tún-túni Nati*.

A weed; used as a pot-herb.

DISTRIB.—Cosmopolitan in the Tropics.

194. \**Amarantus polygamus* Linn.; F. B. I. iv. 721. *A. polygonoides* F. I. iii. 602. E. D. A 941.

Canning Town, *Calcutta Garden Collectors*!

Vernac. *Champa Nati*.

A small cultivated pot-herb.

DISTRIB.—Cosmopolitan in the Tropics.

#### 146. *Psilotrichum* Bl.

195. *Psilotrichum ferrugineum* Moq.; F. B. I. iv. 725. *Achyranthes ferruginea* F. I. i. 675

Northern and western parts, in clearings and on mud-banks.

Vernac. *Rakto Sirinchi*.

A weed; of no economic importance.

DISTRIB.—Common in Lower Bengal.

#### 147. *Alternanthera* Forsk.

196. *Alternanthera sessilis* R. Br.; F. B. I. iv. 731. *Achyranthes triandra* F. I. i. 678. E. D. A 877.

Northern and western parts, in clearings and on mud-banks.

A weed; of little importance except as a mud-binding species.

DISTRIB.—Cosmopolitan in the Tropics.

### L.—CHENOPODIACEÆ.

#### 148. *Salicornia* Linn.

197. *Salicornia brachiata* Roxb.; F. I. i. 84; F. B. I. v. 12 E. D. s 527.

Sundribuns, "on such low wet salt ground as is overflowed by the spring tides," *Roxburgh*.

A gregarious under-shrub; yields barilla; a good mud-binding species.

DISTRIB.—N. Ceylon; Coromandel Coast.

#### 149. *Arthrocnemum* Moq.

198. *Arthrocnemum indicum* Moq.; F. B. I. v. 12. *Salicornia indica*, F. I. i. 85. E. D. A 1475.

Sundribuns, "grows with the former (*Salicornia brachiata*) and on similar ground," *Roxburgh*.

Vernac. *Jadu Palang*.

A gregarious prostrate undershrub; yields barilla; a mud-binding species.

DISTRIB.—Trop. Africa; coasts of India both west and east.

#### 150. *Suaeda* Forsk.

199. *Suaeda maritima* Dumort.; F. B. I. v. 14. *Salsola indica* F. I. ii. 62. E. D. s 2990.

General, on muddy banks.

An erect herb ; sometimes used as a vegetable.

DISTRIB.—Asia generally ; Europe ; N. Africa ; N. America.

### 151. *Basella* Linn.

200. *Basella rubra* Linn , F. B. I. v. 20. *B. alba* F. I. ii. 104.  
E. D. B 203.

Clearings, cultivated ; at Chandpie and Canning Town, also feral,  
*Prain!*

Vernac. *Poi Ság ; Ban Poi.*

A much-branched twining herb : a favourite vegetable.

DISTRIB.—Tropical Africa and Asia.

The form seen in cultivation was in each case the very large form that is propagated by cuttings and not by seed ; the feral state was the white-flowered *Ban Poi*, probably not truly wild, but only feral by reversion, in our area.

## II.—ARISTOLOCHIACEÆ.

### 152. *Aristolochia* Linn.

201. *Aristolochia indica* Linn. ; F. I. iii. 489 ; F. B. I. v. 75.  
E. D. A 1398.

Sea-face at Tiger Point, prostrate on the sand, *Heinig!*

Vernac. *Isharmal.*

A prostrate or climbing under-shrub ; used in native medicine ; also (*Heinig*) a sand-binding plant.

DISTRIB.—Throughout India and in Chittagong.

## LII.—LAURINEÆ.

### 153. *Cassytha* Linn.

202. *Cassytha filiformis* Linn. ; F. I. ii. 314 ; F. B. I. v. 188. E. D.  
C 805.

Sea-face, parasitic, *Heinig!*

Vernac. *Akas-bél.*

A parasitic leafless twiner ; reputed medicinal.

DISTRIB.—Cosmopolitan in the Tropics.

## LIII.—LORANTHACEÆ.

### 154. *Loranthus* Linn.

Flowers with scale-like bracts but without bracteoles :—

Leaves beneath covered with a rusty or whitish scurfy tomentum ;  
corolla-tube 4-cleft . . . . . *Scurrula.*

Leaves beneath glabrous ; corolla-tube shortly 5-fid *longiflorus.*

Flowers with both bracts and bracteoles, the latter connate in a cup; leaves glabrous, corolla tube 6-angled or rarely 5-angled below, and usually 6-partite, rarely 5-partite above . *globosus*.

203. *Loranthus Scurrula* Linn.; F. I. i. 550; ii. 186; F. B. I. v. 208; var. *bengalensis*.

General, especially on Gengwa (*Excæcaria Agallocha*).

Vernac. *Banda*; *Pargátcha*.

A leafy parasite; properties unimportant.

DISTRIB. (of this variety)—Assam; East Bengal.

204. *Loranthus longiflorus* Desr.; F. B. I. v. 214. *L. bicolor* F. I. i. 548; ii. 185. E. D. I. 549.

General, and on many species.

Vernac. *Bara Manda*; *Banda*; *Pargátcha*.

A leafy parasite; properties unimportant.

DISTRIB.—Throughout India.

205. *Loranthus globosus* Roxb.; F. I. i. 550; ii. 187; F. B. I. v. 220.

Occasional, and only seen on *Keora* (*Sonneratia apetala*).

Vernac. *Chhota Manda*; *Banda*; *Pargátcha*.

A leafy parasite; properties unimportant.

DISTRIB.—India generally; W. Indo-China; Malaya.

#### 155. *Viscum* Linn.

206. *Viscum monoicum* Roxb.; F. I. iii. 763; F. B. I. v. 224. E. D. v. 154.

Occasional; Bringalni, *Heinig & Gammie*! Suta Khal, *Prain*!

Vernac. *Banda*; *Pargátcha*.

A leafy parasite; properties unimportant.

DISTRIB.—India; Indo-China.

### LIV.—EUPHORBIACEÆ.

#### 156. *Euphorbia* Linn.

Glands of the involucre with a distinct membranous, petaloid limb

*hypericifolia* var. *indica*.

Glands of the involucre narrowly winged or wingless:—

Erect or ascending herbs; leaves distinctly nerved and copiously hispid with crisped hairs; leaves rarely less than three-quarters of an inch long . . . . . *pilulifera*.

Prostrate herbs; leaves very indistinctly nerved and sparingly hispid; leaves never more than one-third of an inch long

*thymifolia*.

207. *Euphorbia hypericifolia* Linn. VAR. *indica* F. B. I. v. 512. *E. uniflora* F. I. ii. 473. E. D. E. 512.

Northern clearings, rare, *Prain* !

A weed ; properties unimportant.

DISTRIB.—Tropical Asia and Africa.

208. *Euphorbia pilulifera* Linn. ; F. B. I. v. 250. *E. hirta* F. I. ii. 472 E. D. E 531.

Northern clearings, *Calcutta Garden Collectors* !

Vernac. *Bara Kerui*.

A weed of waste places ; properties unimportant.

DISTRIB.—Cosmopolitan in tropical and sub-tropical regions.

209. *Euphorbia thymifolia* Burm. ; F. I. ii. 473 ; F. B. I. v. 252. E. D. E 549.

Northern clearings, rare, *Prain* !

Vernac. *Qveta Kerui*.

A prostrate field-weed ; properties strongly purgative.

DISTRIB.—Tropics everywhere, except in N. Australia.

### 157. *Bridelia* Willd.

210. *Bridelia stipularis* Bl. ; F. B. I. v. 270. *B. scandens*, F. I. iii. 736. E. D. B 873.

Northern forests, *Calcutta Garden Collectors* !

Vernac. *Harinhára*.

A large subscentent evergreen shrub ; wood hard, brown, used as fuel.

DISTRIB.—Trop. Africa ; S.-E Asia.

### 158. *Agyneia* Vent.

211. *Agyneia bacciformis* A. Juss. ; F. B. I. v. 285. *Phyllanthus bacciformis* F. I. iii. 661.

Clearings, and open muddy places in northern and western parts ; common

A sub-littoral herb or under-shrub ; properties unimportant.

DISTRIB.—Mauritius ; Coromandel Coast ; Ceylon ; Java.

### 159. *Phyllanthus* Linn.

212. *Phyllanthus Niruri* Linn ; F. I. iii. 659 ; F. B. I. v. 298. E. D. P 657.

Northern clearings, very plentiful.

Vernac. *Bhui Amla*.

A field weed ; properties medicinal—used externally for skin-affections, internally as a febrifuge.

DISTRIB. Tropics everywhere, except in N. Australia.

160. *Breynia* Forst.

213. *Breynia rhamnoides* Muell-Arg.; F. B. I. v. 330. *Phyllanthus Vitis-Idæa* F. I. iii. 665. E. D. B 858.

Reserved forests, *Heinig!* Jatta, among ruins, *Prain!*

Vernac. *Kali Siki.*

A shrub or small tree; an unimportant weed.

DISTRIB.—S.-E. Asia.

161. *Cyclostemon* Bl.

214. *Cyclostemon assamicus* Hook. f.; F. B. I. v. 342.

Reserved forests, *Heinig!* *Heinig & Gammie!*

Vernac. *Ban Bokal.*

A tree, 30 feet high; wood brown, hard, used for planking.

DISTRIB.—Himalaya; Indo-China.

162. *Antidesma* Linn.

215. *Antidesma Ghaesembilla* Gærtn.; F. B. I. v. 357 *A paniculatum* F. I. iii. 770. *A. pubescens* F. I. iii. 770. E. D. A 1219.

Jatta, among ruins, *Prain!*

Vernac. *Khúdi Gamb; Timtóa.*

A small tree; leaves and fruit eaten; wood used as fuel.

DISTRIB.—Tropics of the Eastern Hemisphere.

163. *Croton* Linn.

216. *Croton oblongifolius* Roxb.; F. I. iii. 685; F. B. I. v. 386. E. D. C 2180.

Northern forests, *Heinig!*

Vernac. *Chucka; Uri-ám (fide Heinig).*

A small deciduous tree; wood whitish-yellow, fairly hard and heavy but liable to crack, used as fuel; seeds yield a purgative oil.

DISTRIB.—India; Indo-China.

This tree is often used as a fence, whence possibly its occurrence in our area is to be explained.

164. *Chrozophora* Neck.

217. *Chrozophora plicata* A. Juss.; F. B. I. v. 409. *Croton plicatus* F. I. iii. 681. E. D. C 2211.

Northern clearings, *Prain!*

Vernac. *Khúdi Okra.*

An annual but sometimes shrubby weed; leaves yield a dye; seeds purgative; liber yields a fibre; whole plant used as fuel.

DISTRIB.—India; Orient; S. Europe; N. Africa.

165. *Acalypha* Linn.

218. *Acalypha indica* Linn.; F. I. iii. 675; F. B. I. v. 416. E. D.  
A 306.

Jatta, among ruins, *Prain*!

Vernac. *Khokli*.

An annual weed; whole plant medicinal—expectorant or emetic according to dose.

DISTRIB.—Tropics of Eastern Hemisphere.

166. *Trewia* Linn.

219. *Trewia nudiflora* Linn.; F. I. iii. 837; F. B. I. v. 423. E. D.  
F 525.

Sea-face, *Heinig*! Northern clearings, not planted.

Vernac. *Pitáli*.

A large tree; wood soft, not durable, used in making native drums; pulp of fruit sometimes eaten.

DISTRIB.—S.-E. Asia.

167. *Mallotus* Lour.

220. *Mallotus repandus* Muell-Arg.; F. B. I. v. 442. *Rottlera*  
*dicocca* F. I. iii. 829.

Northern parts, *Calcutta Garden Collectors*!

Vernac. *Nuna Bhanturi*; *Akús*.

An erect or climbing shrub; wood yellowish-white, hard, used as fuel.

DISTRIB.—S.-E. Asia; New Caledonia.

Heinig cites the first vernacular name here given as connoting *Croton caudatus*, which it apparently does in the Gangetic Plain. So far, however, specimens of *Croton caudatus* have not been sent from the Sundribuns to the Calcutta Herbarium, while the name is given by our collectors along with specimens of *Mallotus repandus*. The two plants are not unlike each other and the use of the same name for both is not surprising. *Croton caudatus* should be looked for.

168. *Sapium* P. Br.

221. *Sapium indicum* Willd.; F. I. iii. 692; F. B. I. v. 471. E. D.  
S 833.

General, *Roxburgh*, *T. Thomson*! *Clarke*! *Heinig*! *Prain*!

Vernac. *Batul*.

A tree, 20 feet high; wood light-brown, soft, used as fuel; seeds used by fishermen to poison water.

DISTRIB.—Southward to Tenasserim.



169. *Excœcaria* Linn.

222. *Excœcaria Agallocha* Linn ; F. I. iii. 756 ; F. B. I. v. 472  
E. D. E 593

Extremely plentiful everywhere, from the northern clearings to the sea-face.

Vernac. *Gengwa* ; *Geria* ; *Gheria* ; *Geo*.

A tree, 30-50 feet high ; wood white, soft, chiefly used as fuel, but also for making jhools, dabbas, posts, planks, native drums and toys : charcoal also is made from it and an oil is extracted. The juices of this tree, which is the commonest of all the Sundribun species, are poisonous.

DISTRIB.—Coasts of S.-E. Asia ; N. Australia ; and Polynesia.

The breathing organs developed in connection with the roots of *Gengwa* do not assume the form of vertical blind root-suckers like those of *Amoora*, *Avicennia*, *Sonneratia*, etc., but consist of horizontal thickened segments, richly furnished with lenticels, that protrude through the mud, exactly as in *Carapa obovata*.

## IV.—URTICACEÆ.

170. *Trema* Lour.

223. *Trema orientalis* Bl. ; F. B. I. v. 484. *Celtis orientalis*  
F. I. ii. 65. E. D. T 522.

Jatta, among ruins, *Prain* !

Vernac. *Chikun*.

A large tree-weed ; wood soft, used for making charcoal ; liber yields a tolerable fibre.

DISTRIB.—S.-E. Asia.

171. *Streblus* Lour.

224. *Streblus asper* Lour. ; F. B. I. v. 489. *Trophis aspera*  
F. I. iii. 761. E. D. S 2912.

Northern forests, *Calcutta Garden Collectors* !

Vernac. *Shiora*.

A shrub or small tree ; wood white, moderately hard, close-grained, tough, elastic ; used to make cart-wheels, and gives a good fuel ; juice medicinal, and used instead of rennet ; the twigs are used in cleaning teeth ; the leaves are used to polish wood.

DISTRIB.—Everywhere throughout S.-E. Asia.

This is often used as a hedge-plant—a purpose which it serves admirably ; possibly its presence in our area is due to this fact.

172. *Ficus* Linn.

Petiole rigid, never more than half-an-inch long, usually shorter ;  
aves ovate or rhomboid-elliptic . . . *retusa* var. *nitida*.

Petiole flexible, never less than an inch and a half long, usually longer :—

Leaves 3-nerved at base ; petiole not exceeding two inches long . . . . . *infectoria*.

Leaves 5-7-nerved at base ; petiole two and a half inches long or longer :—

Stipules large ; petiole two and a half to three and a half inches long ; leaf-blade with a cuspidate apex one-fifth the length of the blade proper . . . . . *Rumphii*.

Stipules minute ; petiole three to four inches long ; leaf-blade with a caudate apex half the length of the blade proper  
*religiosa*.

225. *Ficus retusa* Linn. VAR. *nitida* King ; F. B. I. v. 541. *F. Benjamina* F. I. iii. 550.

Reserved Forests, *Heinig!* *Lace!*

Vernac. *Fir* ; *Zir*.

A tree, 50 feet high ; wood worthless.

DISTRIB.—S.-E. Asia ; N. Caledonia.

226 *Ficus infectoria* Roxb. ; F. I. iii. 550 ; F. B. I. v. 515. E. D. F 216.

Jatta, among ruins, *Prain!*

Vernac *Pakúr*.

A low deciduous tree ; wood worthless.

DISTRIB.—S.-E. Asia. In India it is often planted, as it possibly originally was here.

227. *Ficus Rumphii* Bl. ; F. B. I. v. 512. *F. cordifolia* F. I. iii. 548. E. D. F 265.

Sea-face, *Heinig!* Jatta, among ruins, *Prain!*

Vernac *Ausat* ; *Gaiasvattha*.

A large tree ; wood worthless.

DISTRIB.—S.-E. Asia.

228. *Ficus religiosa* Linn. ; F. I. iii. 547 ; F. B. I. v. 513.

Jatta, growing on an old pagoda, *Prain!*

Vernac. *Asvattha* ; *Ausat*.

A large tree ; wood worthless. A sacred species, whence possibly its presence here.

DISTRIB.—Bengal generally to the foot of the Himalaya ; C. India : elsewhere planted.

## LVI.—CASUARINEÆ.

### 173. *Casuarina* Forst.

229. *Casuarina equisetifolia* Forst. ; F. B. I. v. 599. *C. muricata* F. I. iii. 519.

Banks of Jeodhara Khal, self-sown, *Lace! Prain!*

Vernac. *Bilati Fau.*

A tall handsome tree; wood brown, very hard and durable, but apt to crack ; makes excellent fuel.

DISTRIB.—Shores of Indo-China ; Malaya ; Australia ; Polynesia.

The presence of this species within our area as a wild tree, far from any planted examples, was first noticed by Mr. Lace. Probably the seeds which have given origin to these trees along the Jeodhara Khal, have been brought down by the stream from Morellganj, where an avenue of *Casuarinas* exists that was planted about 100 years ago.

## LVII.—CERATOPHYLLÆ.

### 174. *Ceratophyllum* Linn.

230. *Ceratophyllum demersum* Linn. ; F. B. I. v. 639. *C. verticillatum* F. I. iii 624

Ponds and jhils in northern clearings.

Vernac. *Fhangi.*

A submerged aquatic ; properties unimportant.

DISTRIB.—Cosmopolitan in the Tropics.

## MONOCOTYLEDONES.

## LVIII.—HYDROCHARIDÆ.

### 175. *Hydrilla* Rich.

231. *Hydrilla verticillata* Casp. ; F. B. I. v. 659. *Serpicula verticillata* F. I. iii. 578. *Vallisneria verticillata* F. I. iii. 751.

Ponds and jhils in northern clearings.

Vernac. *Fhangi; Kuréli.*

An aquatic weed ; properties unimportant.

DISTRIB.—Tropical and sub-tropical regions of the Eastern Hemisphere and Australia.

### 176. *Lagarosiphon* Harv.

232. *Lagarosiphon Roxburghii* Benth. ; F. B. I. iii. 659. *Vallisneria alternifolia* F. I. iii. 50.

Ponds and jhils in northern clearings.

Vernac. *Rasna-jhangi.*

An aquatic weed ; properties unimportant.

DISTRIB.—S.-E. Asia.

### 177. *Vallisneria* Linn.

233. *Vallisneria spiralis* Linn. ; F. B. I. iii. 660. *V. spiraloïdes* F. I. iii. 750. E. D. v 14.

Ponds and jhils in northern clearings.

Vernac. *Syála*.

An aquatic weed ; properties unimportant.

DISTRIB.—Cosmopolitan in tropical and sub-tropical regions.

### 178. *Ottelia* Linn.

234. *Ottelia alismoides* Pers. ; F. B. I. v. 662. *Damasonium indicum* F. I. ii. 216.

Ponds in northern clearings, rare, *Heinig*!

Vernac. *Parmi Kalla*.

An aquatic weed ; properties unimportant.

DISTRIB.—S.-E. Asia ; N. Australia.

## LIX. — ORCHIDACEÆ.

### 179. *Oberonia* Lindl.

235. *Oberonia Gammiei* King & Pantling.

Eastern forests, *Heinig & Gammie*! *Prain*! *Lace*!

An epiphytic orchid ; properties insignificant.

### 180. *Dendrobium* Sw.

Leaves equitant, fleshy, distichous ; flowers small . . . *anceps*.

Leaves not equitant, subcoriaceous ; flowers showy . . . *Pierardi*.

236. *Dendrobium anceps* Sw. ; F. I. iii. 487 ; F. B. I. v. 724.

Reserved Forests, *Roxburgh*, *Heinig & Gammie*! *Lace*!

An epiphytic orchid ; of no economic value.

DISTRIB.—E. Himalaya ; Assam ; Tenasserim.

237. *Dendrobium Pierardi* Roxb. ; F. I. iii. 482 , F. B. I. v. 738.

"Delta of the Ganges," *Roxburgh*.

A showy epiphytic orchid.

DISTRIB.—E Himalaya ; Chittagong ; Tenasserim.

For this species the *locus classicus* is the Sundribuns, though it has not been collected there since *Roxburgh*'s day ; it should be looked for.

### 181. *Cirrhopetalum* Lindl.

238. *Cirrhopetalum Roxburghii* Lindl. ; F. B. I. v. 774. *Ærides radiatum* F. I. iii. 476.

Eastern forests, *Carey*, *fide Roxburgh* ; *Prain*! *Lace*!

An epiphytic orchid with small but handsome flowers.

### 182. *Trias* Lindl.

- 239 *Trias oblonga* Lindl. ; F. B. I. v. 780.

Eastern forests, *Heinig & Gammie*! *Prain*! *Lace*!

An epiphytic orchid ; of no economic importance.

DISTRIB.—Chittagong ; Tenasserim.

### 183. *Luisia* Gaud.

Stems rather stout ; sepals and petals pale yellowish-green ; epichile of lip rhomboid, subtruncate, hypochile saccate *teretifolia*.

Stems very slender ; sepals green outside, rose-purple inside, petals rose-purple with green base and tip ; epichile of lip wide-ovate, hypochile almost flat *brachystachys*.

240. *Luisia teretifolia* Gaud ; F. B. I. vi. 22. *Cymbidium triste* F. I. iii. 46 .

General, but not plentiful, *Egerton, fide Roxburgh (1809) ; Heinig & Gammie ; Prain !*

Vernac. *Pargátcha*.

An epiphytic orchid ; of no economic value.

DISTRIB.—S-E. Asia ; Melanesia.

241. *Luisia brachystachys* Bl. ; F. B. I. vi. 23.

Everywhere in the eastern and central forests, very common, *Heinig ! Heinig & Gammie ! Prain ! Lace !*

Vernac. *Pargátcha*.

An epiphytic orchid ; of no economic value.

DISTRIB.—Himalaya ; Assam ; Tenasserim.

### 184. *Saccolabium* Bl.

Peduncle slender, long, laxly paniculately branched ; lip with a long cylindric spur *ochraceum*.

Peduncle stout, short ; lip with a short conical spur :—

Peduncles shortly corymbosely branched *longifolium*.

Peduncles simple, flowers in umbel-like corymbs *papillosum*.

242. *Saccolabium ochraceum* Lindl. ; F. B. I. vi. 62.

Eastern forests, rather common, *Heinig ! Heinig & Gammie ! Prain ! Lace !*

Vernac. *Pargátcha*.

An epiphytic orchid ; properties unimportant.

DISTRIB.—S. India ; Ceylon ; E. Himalaya ; Khasia ; Tenasserim.

243. *Saccolabium longifolium* Hook. f. ; F. B. I. vi. 62.

Eastern forests, at Supoti, *Heinig !*

Vernac. *Pargátcha*.

An epiphytic orchid ; properties unimportant.

DISTRIB.—E. Himalaya ; Assam ; Tenasserim.

244. *Saccolabium papillosum* Lindl. ; F. B. I. vi. 63. E. D. A 317.

Reserved forests, not uncommon, *Calcutta Garden Collectors!*  
*Heinig! Lace!*

Vernac. *Pargátcha*; ? *Rasna*.

An epiphytic orchid; properties unimportant.

DISTRIB.—Circars; E. Himalaya; Assam; Tenasserim.

### 185. *Sarcanthus* Lindl.

Leaves elongate, filiform; flowers in longish racemes *appendiculatus*.  
Leaves oblong, short, amplexicaul; flowers in short spikes *insectifer*.

245. *Sarcanthus appendiculatus* Hook. f.; F. B. I. vi. 67.

Forests near sea-face, *Prain!* Eastern Forests, *Lace!*

Vernac. *Pargátcha*.

An epiphytic orchid; properties unimportant.

DISTRIB.—Tenasserim; E. Himalaya.

246. *Sarcanthus insectifer* Reichb. f.; F. B. I. vi. 68.

Reserved forests, everywhere, very common, *Heinig! Heinig & Gammie! Prain! Lace!*

Vernac. *Pargátcha*.

An epiphytic orchid; of no economic value.

DISTRIB.—Bengal; Behar; Cachar; Tenasserim.

This species is exceedingly plentiful throughout the Sundribuns and is the commonest orchid in these forests; the next most common is *Luisia brachystachys*, which is almost as plentiful. The third place, but a long way behind the other two, is taken by *Saccolabium ochraceum*. All the other species may be looked on as rare or uncommon.

### 186. *Cleisostoma* Hook. f.

247. *Cleisostoma ramosum* Hook. f.; F. B. I. vi. 72.

Occasional in the reserved forests; *Wallich! Clarke! Heinig & Gammie!*

Vernac. *Pargátcha*.

An epiphytic orchid; of no economic value.

DISTRIB.—E. Himalaya; Tenasserim.

## LX.—SCITAMINEÆ.

### 187. *Zingiber* Adans.

248. *Zingiber Casumunar* Roxb.; F. I. i. 40; F. B. I. vi. 248.  
E. D. z 199.

Jatta, among ruins, *Prain!*

Vernac. *Ban Ádú*.

A herb with perennial rootstock; properties aromatic and stimulant.

DISTRIB.—Tropical Asia, usually cultivated: no doubt here the species was originally introduced.

188. *Alpinia* Linn.

249. *Alpinia Allughas* Roscoe; F. I. i. 61; F. B. I. vi. 253. E. D. A 849.

Northern river-banks, Dacopie, *Heinig*!

Vernac. *Hazi*; *Taruko*.

A large herb with perennial rootstock; properties aromatic.

DISTRIB.—India; Indo-China.

## LXI.—AMARYLLIDACEÆ.

189. *Crinum* Linn.

250. *Crinum asiaticum* Linn.; F. B. I. vi. 280. *C. toxicarium* F. I. ii. 134. E. D. C 2062.

Plentiful on river-banks in the northern and central forests, sometimes occurring also in the interior of the islands, *Heinig*! *Prain*!

Vernac. *Káchori*

A large succulent herb; properties emetic.

DISTRIB.—Coasts of Ceylon: common elsewhere in India, but cultivated.

## LXII.—DIOSCOREACEÆ.

190. *Dioscorea* Linn.

251. *Dioscorea pentaphylla* Linn.; F. I. iii. 806; F. B. I. vi. 289. E. D. D 522.

Jatta, among ruins, *Prain*!

Vernac. *Kanta-álu*.

A large climber with bulbiferous stems; root-tubers sometimes eaten.

DISTRIB.—Tropics of Eastern Hemisphere.

## LXIII.—LILIACEÆ.

191. *Asphodelus* Linn.

252. *Asphodelus tenuifolius* Cav.; F. B. I. vi. 332. *A. clavatus* F. I. ii. 148. E. D. A 1579.

"Sundribuns," *Calcutta Garden Collectors* (1845)!

An annual weed; occasional only in fields in Lower Bengal and then usually only when the crop with which it is associated is raised from seed imported from Upper India; it has not been reported from the Sundribun clearings since 1845. In Upper India the seeds are used medicinally.

DISTRIB.—Africa; Upper India.

## LXIV.—COMMELINACEÆ.

192. *Commelina* Linn.

253. *Commelina benghalensis* Linn.; F. B. I. vi. 370. E. D. C 1748.  
 Jatta, among ruins, *Prain*!  
 Vernac. *Kánchará*.

A weed; leaves sometimes used as a vegetable.

DISTRIB.—Tropics of Eastern Hemisphere.

193. *Aneilema* R. Br.

254. *Aneilema nudiflorum* R. Br.; F. B. I. vi. 378. *Commelina nudiflora* F. I. i. 173.

Sea-face, growing in sand, *Heinig*!

A slender weed; of no economic importance.

DISTRIB.—S.-E. Asia.

The presence of this species on the coast is probably due to its seeds having been brought from the Upper Gangetic plain by the great rivers.

## LXV.—FLAGELLARIÆ.

194. *Flagellaria* Linn.

255. *Flagellaria indica* Linn.; F. I. ii. 154; F. B. I. vi. 391.

Northern forests, and margins of clearings; also sea-face at Tiger Point, *Heinig*! *Calcutta Garden Collectors*! *Prain*!

Vernac. *Ah Beti*; *Kuh Bent*; *Banchanda*.

A lofty, slender, glabrous, cane-like climber; the stems are used to make native pens.

DISTRIB.—Tropics of the Eastern Hemisphere, near the coasts.

## LXVI.—PALMEÆ.

195. *Nipa* Wurm.

256. *Nipa fruticans* Wurm.; F. I. iii. 650; F. B. I. vi. 424.  
 E. D. N 163.

Everywhere on banks of estuaries and tidal rivers, and in swampy localities in interior of reserved forests.

Vernac. *Gólpatta*.

A soboliferous palm with a very large rootstock; an excellent protection for muddy banks. The large grooved leaf-stalks are used as floats for sundri-logs; the young leaves are twisted into rough ropes; the full-grown leaves are cut and exported for thatch. The young fruit is edible; toddy is obtained from the spathe.

DISTRIB.—Ceylon; Indo-China; Malaya; N. Australia: in mangrove-swamps.



196. *Areca* Linn.257. \**Areca Catechu* Linn.; F. I. iii. 615; F. B. I. vi. 405. E. D.

A 1294.

Eastern Sundribuns, Backerganj Dist., cultivated.

Vernac. *Supári*.

A tall graceful palm with slender stem; yields the Betel-nut.

DISTRIB.—Cultivated, usually near the sea, throughout S.-E. Asia.

197. *Phoenix* Linn.258. *Phoenix paludosa* Roxb.; F. I. iii. 789; F. B. I. vi. 427.

E. D. P 582.

Everywhere on or near banks of tidal rivers.

Vernac. *Hantál*; *Hiál*.

A gregarious palm, usually about 12 feet high, rarely higher; stems used for the framework of walls of native houses and for the dunnage of roofs; leaves used in thatching; fruit eaten; the roots send up short blind vertical root-suckers.

DISTRIB.—All Indo-Chinese coasts.

The height given for this species in the F. B. I. is up to 25 feet, but the tallest examples in the Calcutta Garden (and these are taller than any seen in the Sundribuns) do not reach 20 feet. The diameter is given in the F. B. I. as 12-18 inches; the largest stem, out of many hundreds measured, has not been found to exceed  $2\frac{1}{2}$  inches in diameter; local officers might make observations on these points.

*Phoenix sylvestris* Linn., the Khajúr or wild date, is grown in the Bengal plain as a toddy palm just north of the Sundribun area, and possibly exists within the eastern Sundribuns (South Backerganj).

198. *Calamus* Linn.259. *Calamus tenuis* Roxb.; F. I. iii. 780; F. B. I. vi. 447.

E. D. C 114.

Northern forests, *Heinig*!Vernac. *Sanchi Bent*.

A cane with long scandent stems; used for making the seats and backs of chairs, baskets, and the like.

DISTRIB.—Himalaya; Indo-China.

This is given in Heinig's list as *C. Rotang*; that species, however, is confined to S. India and Ceylon: Mr. Heinig's specimens are of *C. tenuis*.

199. *Dæmonorops* Bl.260. *Dæmonorops Jenkinsianus* Mart.; F. B. I. vi. 462. E. D. C 99.Northern forests, *T. Thomson*! *Heinig*!Vernac. *Gola Bent*.

A stout scandent "rattan"; stems used for the same purposes as those of *Calamus tenuis*.

DISTRIB.—E. Himalaya; Assam; Chittagong

This is given as *Calamus longipes* by Heinig, who mentions other "rattans" as associated with this and *C. tenuis*. No specimens of other species have been communicated, but, from Mr. Heinig's remark, it is probable that others do occur: they should be looked for.

## 200. *Cocos* Linn.

261. \**Cocos nucifera* Linn.; F. I. iii. 614; F. B. I. vi. 482. E. D. C 1520.

Eastern Sundribuns, S. Backerganj, cultivated.

Vernac. *Narikel*.

A tall unbranched palm; yields the coco-nut, also coir from the husk of the nut; the wood, known as Porcupine wood, is durable.

DISTRIB.—Cosmopolitan on tropical coasts.

*Borassus flabellifer* Linn., the Tari Gách, a tall dioecious palm with fan-shaped leaves, is cultivated in the Bengal plain just north of the Sundribuns and may occur in the Eastern Sundribuns (S. Backerganj).

## LXVII.—PANDANEE.

### 201. *Pandanus* Linn. f.

Carpels not united in groups; stamens free . . . *fœtidus*.

Carpels united in groups; stamens connate . . . *fascicularis*.

262. *Pandanus fœtidus* Roxb.; F. I. iii. 742; F. B. I. vi. 483.

Northern forests, *Heinig*.

Vernac. *Kotki Kánta*.

A shrubby screw-pine; properties insignificant.

DISTRIB.—Assam; Burma; Chittagong.

This is given in Heinig's list, but no specimens have been received; the record needs confirmation. This species is occasionally planted as a hedge and it may belong to the category of plants to which *Bouea*, *Cassia Fistula*, *Diospyros Embryopteris*, *Ægle*, *Cratæva*, etc., belong.

263. *Pandanus fascicularis* Lamk.; F. B. I. vi. 485. *P. odoratissimus* F. I. iii. 738. E. D. P 26.

Very general and often very abundant.

Vernac. *Kewa Kánta*.

A shrubby screw-pine, occasionally 10-15 feet high, usually much smaller. Leaves used for thatching; flowers eaten with pán; oil distilled and employed to mitigate the odour of castor oil.

DISTRIB.—India; Indo-China; Malaya; S. China; Polynesia.

## LXVIII.—TYPHACEÆ.

### 202. *Typha* Linn.

Leaves usually more than an inch wide, trigonous above the sheath . . . *elephantina*.

Leaves usually less than an inch wide, semi-cylindric above the sheath

*angustata*.

264. *Typha elephantina* Roxb. ; F. I. iii. 566 ; F. B. I. vi. 489.  
E. D. T 864 partly.

Northern parts, on river-banks along the outskirts of the reserved forests.

Vernac. *Hogla*.

A large bulrush ; leaves used in thatching ; the split reeds are woven into mats for covering boats and for making walls and partitions of houses.

DISTRIB.—India ; Indo-China ; N. Africa.

265. *Typha angustata* Chaub. & Bory ; F. B. I. vi. 489. *T. angustifolia* F. I. iii. 567. E. D. T 864 partly.

Northern parts, on banks of ponds and rivers.

Vernac. *Hogla*.

A large bulrush ; used with and like the preceding.

DISTRIB.—S. Europe ; N. Africa ; N. Asia ; India ; Indo-China.

This is the commoner of the two bulrushes in Lower Bengal, to the north of the Sundribun area.

## LXIX.—AROIDEÆ.

### 203. *Cryptocoryne* Fisch.

266. *Cryptocoryne ciliata* Fisch. ; F. B. I. vi. 492. *Ambrosinia ciliata* F. I. iii. 491.

Small creeks in northern clearings, on fringe of northern forests, very abundant. *Prain* !

A stoloniferous aquatic with linear-lanceolate leaves, growing in mud and submerged at high-tides ; properties unimportant.

DISTRIB.—C. Bengal ; Malaya.

### 204. *Pistia* Linn.

267. *Pistia Stratiotes* Linn. ; F. I. iii. 131. ; F. B. I. vi. 497.  
E. D. P 874.

Tanks and jhils, northern clearings, *Heinig* ! *Prain* !

Vernac. *Táká-páná*.

A floating aquatic ; an infusion of the leaves, also the soluble part of the ashes of the incinerated plant, used medicinally.

DISTRIB.—Cosmopolitan in the Tropics.

## LXX.—NAIADACEÆ.

### 205. *Ruppia* Linn.

268. *Ruppia rostellata* Koch ; F. B. I. vi. 568.

Northern parts, in ponds and jhils, very common.

Vernac. *Jhángi*.

A submerged aquatic; properties unimportant.

DISTRIB.—Europe; Temp. and Trop. Asia.

### 206. *Najas* Linn.

269. *Najas minor* All.; F. B. I. vi. 569. *N. dichotoma* F. I. iii. 749.

Pond at Jeodhara, *Prain*!

Vernac. *Phāngi*.

A submerged aquatic; properties unimportant.

DISTRIB.—General in the Eastern Hemisphere.

## LXXXI.—CYPERACEÆ.

### 207. *Kyllinga* Rottb.

270. *Kyllinga triceps* Rottb.; F. I. i. 181; F. B. I. vi. 587.

Jatta, among ruins, *Prain*!

Vernac. *Nirbishi*.

A small sedge; properties unimportant.

DISTRIB.—Africa; S.-E. Asia; Australia.

### 208. *Pycereus* Beauv.

271. *Pycereus polystachyus* Beauv.; F. B. I. vi. 392. *Cyperus polystachyus* F. I. i. 193.

In all the northern cleared or partially cleared spaces, plentiful; also at the sea-face among sand, *Heinig*! *Prain*!

Vernac. *Jangli Modhi*.

A small glabrous sedge; properties unimportant, except that it is a sand-binding species.

DISTRIB.—Cosmopolitan on or near tropical and sub-tropical sea-shores.

### 209. *Cyperus* Linn.

Fruit, a plano-convex nut, with a flat face next the rachilla; umbels compound; leaves and bracts long . . . *inundatus*.

Fruit, an equilaterally trigonous nut:—

Stoloniferous sedges:—

Stolons long, hardening at length into woody rootstocks; leaves short or 0; stems stout:—

Leaves very few, 2-3 in. (rarely as much as 6 in.) long; rachilla with a very narrow wing; glumes when dry with their margins crisply incurved all round

*malaccensis*.

Leaves hardly any; rachilla distinctly winged; glumes when dry with their margins recurved *tegetiformis*.

Stolons short, slender, with very slender stems

*scariosus*.

- Stolons 0 ; leaves and bracts long ; rachilla distinctly winged . . . *exaltatus* var. *dives*.
272. *Cyperus inundatus* Roxb. ; F. I. i. 301. *Juncellus inundatus* F. B. I. vi. 595 E. D. C 2601.  
River-banks, not uncommon.  
Vernac. *Pati*.
273. *Cyperus malaccensis* Lamk. ; F. B. I. vi. 608. *C. Pangorei* F. I. i. 202. E. D. C 2609.  
Banks of Cheila Bogi river, *Heinig & Gammie* !  
Vernac. *Chumati Pati*.  
A large glabrous sedge ; useful for binding and protecting muddy river-banks.  
DISTRIB.—S.-E Asia ; Australia ; Polynesia.  
A stout sedge ; an excellent mud-binding species.  
DISTRIB.—Silhet ; E. Bengal ; C. Bengal.
274. *Cyperus tegetiformis* Roxb. ; F. B. I. vi. 612. *C. nudus* F. I. i 209.  
Sea-face at Tiger Point, *Heinig* !  
• Vernac. *Halarzu ; Goola-methi*.  
A large glabrous sedge ; properties unimportant.  
DISTRIB.—India ; Indo-China ; China ; Japan.  
This sedge is plentiful in swampy places in C. Bengal, but has not hitherto been reported from the coasts of India ; doubtless its seeds have been washed down by the great rivers and cast up at Tiger Point.
275. *Cyperus scariosus* R. Br. ; F. B. I. vi. 612. *C. pertenuis* F. I. i. 198 E. D. C 2617 partly only.  
Northern settlements and partial clearings, plentiful, *Clarke* !  
Vernac. *Nagar Modhi*.  
DISTRIB.—Indo-China ; Australia.  
Very like the preceding species but more slender in all its parts ; in India this plant is confined to the northern Sundribuns and the immediately adjacent portion of Lower Bengal.
276. *Cyperus exaltatus* Retz VAR. *dives* Clarke ; F. B. I. vi. 617. *C. umbellatus* F. I. i 205.  
Northern clearings, in ponds and jhils, *Kurz* ! *Calcutta Garden Collectors* ! *Clarke* !  
A tall sedge ; used for making matting.  
DISTRIB.—Northern India.

## 210. *Mariscus* Vahl.

277. *Mariscus albescens* Gaud. ; F. B. I. vi. 623.  
Chandpie, *Prain* ! Sea-face, very abundant, *Heinig* ! *Prain* !

Vernac. *Halaiya*.

A large greyish sedge; one of the most useful of sand-binding species.

DISTRIB.—Tropical shores from Africa to Polynesia.

### 211. *Eleocharis* R. Br.

278. *Eleocharis spiralis* R. Br.; F. B. I. vi. 627. *Scirpus spiralis* F. I. i. 212.

In shallow standing water, near coast, *Heinig*!

Vernac. *Halaiya*.

A slender pipe-sedge; properties unimportant.

DISTRIB.—India; Indo-China.

### 212. *Fimbristylis* Vahl.

Lower glumes of the spikelets in a continuous spiral:—

Spikelets never more than half an inch long, usually considerably shorter:—

Spikelets in an umbel of usually 5-10, sometimes up to 20, very rarely 3, 2 or 1; glumes puberulous *ferruginea*.

Spikelets usually solitary, very rarely 2 or 3; glumes glabrous . . . *polytrichoides* var. *halophila*.

Spikelets always three-quarters of an inch to an inch long, solitary or 2-3, rarely 4-6 . . . *sub-bispicata*.

Lower glumes of the spikelets distichously imbricate *monostachya*.

279. *Fimbristylis ferruginea* Vahl; F. B. I. vi. 638. *Scirpus globulosus* F. I. i. 227.

Very common, both in the northern clearings and at the sea-face.

A tufted sedge; sand-binding, otherwise with properties unimportant.

DISTRIB.—Cosmopolitan in tropical and sub-tropical countries.

280. *Fymbristylis polytrichoides* Vahl VAR. *halophila* Kurz; F. B. I. vi. 632.

Canning Town, *Kurz*! *Calcutta Garden Collectors*! Jatta, Chandpie, Jeodhara, etc., *Prain*!

A sub-littoral sedge, known only (this variety) from the Sundribuns and Madras.

281. *Fimbristylis sub-bispicata* Nees & Meyen; F. B. I. vi. 634. Sundribun sea-face, *Heinig*!

A littoral sedge; sand-binding; known in India only from the Sundribun coast and from Orissa; common on the coasts of China and Japan.

282. *Fimbristylis monostachya* Hassk.; F. B. I. vi. 649. *Scirpus schænoides* F. I. i., 221,

Jatta, *Prain*!

A small glabrous sedge, common in the Gangetic plain.

DISTRIB.—Cosmopolitan in the Tropics.

### 213. *Scirpus* Linn.

Spikelets very many, in large decompound corymbs with several very large flat divaricate leafy bracts . . . . *grossus*.

Spikelets few ; lowest bract alone manifest and resembling a continuation of the stem :—

Stems more or less 3-cornered at least in the upper portion and not transversely septate ; flowers with hypogynous bristles ; spikelets pedicelled :—

Hypogynous bristles plumose with spreading hairs *littoralis*.

Hypogynous bristles scabrid but not plumose

*triqueter* var. *segregata*.

Stems terete throughout, transversely septate ; flowers without hypogynous bristles ; spikelets clustered in a dense lateral head . . . . *articulatus*.

283. *Scirpus grossus* Linn. f. ; F. I. i. 231 ; F. B. I. vi. 659.

Northern and eastern parts, in still water.

Vernac. *Kasúru*.

A large sedge ; properties unimportant.

DISTRIB.—S.-E. Asia.

284. *Scirpus littoralis* Schrad. ; F. B. I. vi. 659. *S. pectinatus* F. I. i. 218.

Northern parts, *Kurz ! Calcutta Garden Collectors !*

An aquatic sedge ; properties unimportant.

DISTRIB.—Europe ; Africa ; Orient ; India ; Australia.

285. *Scirpus triqueter* Linn. VAR. *segregata* Clarke ; F. B. I. vi. 658.

Northern clearings, *Clarke !*

A sedge of muddy places ; properties unimportant.

DISTRIB.—Northward into the Bengal Plain ; New Guinea.

286. *Scirpus articulatus* Linn. ; F. I. i. 214 ; F. B. I. vi. 656.

Northern parts, rare, *Heinig !*

An aquatic sedge of wet places ; properties unimportant.

DISTRIB.—Africa ; S.-E. Asia ; Australia.

### 214. *Cladium* P. Br.

287. *Cladium riparium* Benth. VAR. *crassa* Clarke ; F. B. I. vi. 675.  
Eastern Sundribuns, plentiful, *Clarke !*

A very large sedge, about 6 feet high.

DISTRIB.—Ceylon.

This has only been obtained by Clarke and only to the east of the Madumati, but it is, where it occurs, abundant. It might be looked for in the area between the Hughli and the Madumati.

### 215. *Scirpodendron* Zipp.

288 *Scirpodendron costatum* Kurz ; F. B. I. vi. 684.

Reserved forests, south of Suta Khal, growing with *Pandanus* in the swampy interior, *Prain* !

A stout sedge with large woody nuts enclosed in a succulent, edible epicarp.

DISTRIB.—Ceylon ; Malaya ; Australia ; Samoa.

## LXXII.—GRAMINEÆ.

### 216. *Paspalum* Linn.

Stems decumbent at base ; leaves rather broad ; spikelets orbicular  
*scrobiculatum*.

Stems creeping and rooting ; leaves narrow ; spikelets ovate-oblong  
*distichum*.

289. *Paspalum scrobiculatum* Linn. ; F. I. i. 278 ; F. B. I. vii. 10.

*P. Kora* F. I. i. 279. E. D. p 332.

Jatta, *Prain* ! Canning Town, *Calcutta Garden Collectors* !

Vernac. *Kodo-dhan*.

A fodder grass.

DISTRIB —Cosmopolitan in the Tropics.

290. *Paspalum distichum* Linn. ; F. B. I. vii. 12. *P. longiflorum*  
F. I. i. 279.

Sundribuns, *Hooker & Thomson* ! at Kabutar, plentiful, *Prain* !

An indifferent fodder-grass ; valuable as a mud and sand-binding plant.

DISTRIB.—On all tropical coasts.

### 217. *Eriochloa* H. B. & K.

291. *Eriochloa polystachya* H. B. & K. ; F. B. I. vii. 20. *Milium*  
*ramosum* F. I. i. 316. E. D. p 287.

Northern clearings, very plentiful.

A quick-growing grass of wet places ; a tolerable fodder.

DISTRIB.—Cosmopolitan in the Tropics.

### 218. *Panicum* Linn.

Spikelets paniculate :—

Panicles open, with long slender branches :—

Leaves green, flat . . . . . *proliferum*.

Leaves glaucous, convolute . . . . . *repens*.



Panicles compact, spiciform, with short adpressed branches

*Myurus.*

Spikelets on the branches of a simple raceme :—

Raceme with subsecund at length spreading branches

*prostratum.*

Racemes contracted or pyramidal :—

Spikelets not awned . . . . . *colonum.*

Spikelets awned . . . . . *Crus Galli.*

292. ***Panicum proliferum*** Lamk. ; F. B. I. vii. 50. *P. paludosum*

F. I. i. 307.

Northern clearings, in ponds and jhils.

Vernac. *Borúti* ; *Kalas-nár.*

A matted floating grass ; a poor fodder.

DISTRIB.—Cosmopolitan in the Tropics.

293. ***Panicum repens*** Linn. ; F. B. I. vii. 49. *P. uliginosum* F. I.

i. 308. E. D. P 75.

Northern parts, in wet places and on river-banks.

Vernac. *Barandá.*

A coarse grass and an indifferent fodder, but a very valuable mud-binding species.

DISTRIB.—Cosmopolitan in tropical and sub-tropical countries.

294. ***Panicum Myurus*** H. B. & K. ; F. B. I. vii. 39. *P. serrulatum*

F. I. i. 307.

Northern clearings, in ponds, *Heinig*!

A matted floating grass ; a poor fodder.

DISTRIB.—S.-E. Asia ; N. Australia ; Trop. America.

295. ***Panicum prostratum*** Lamk. ; F. B. I. vii. 33. E. D. P 72.

Jatta, among ruins, *Prain*!

A small creeping grass ; an excellent fodder.

DISTRIB.—Cosmopolitan in the Tropics.

296. ***Panicum colonum*** Linn. ; F. B. I. vii. 32. E. D. P 45.

Jatta, *Prain*!

Vernac. *Sháma.*

A slender grass ; an excellent fodder.

DISTRIB.—Cosmopolitan in the Tropics.

297. ***Panicum Crus-Galli*** Linn. ; F. B. I. vii. 30. *P. hispidulum*

F. I. i. 303. E. D. P 48.

Northern clearings, rare, *Calcutta Garden Collectors*!

A rather coarse grass ; a good fodder when young.

DISTRIB.—Cosmopolitan in the Tropics.

219. *Setaria* Beauv.

Panicle spiciform, cylindric; bristles with erect or spreading barbs.

Panicle subpyramidal, the lower involucels in segregate clusters;  
bristles with reversed barbs . . . . . *glauc.*  
*verticillata.*

298. *Setaria glauca* Beauv.; F. B. I. vii. 79. *Panicum glaucum*  
F. I. i. 285. E. D. P 1207.

Jatta, *Prair*!

Vernac. *Pingi Natchi*.

An erect annual grass; a moderately good fodder.

DISTRIB.—Cosmopolitan in tropical and sub-tropical regions.

299. *Setaria verticillata* Beauv.; F. B. I. vii. 80. *Panicum verti-*  
*cillatum* F. I. i. 301. E. D. P 1223.

Northern clearings, rare, *Calcutta Garden Collectors*!

Vernac. *Dora-biyára*.

A rank grass; a tolerable fodder when young.

DISTRIB.—Cosmopolitan in tropical and sub-tropical regions.

220. *Chamæraphis* R. Br.

300. *Chamæraphis spinescens* Poir.; F. B. I. vii. 62.

Northern clearings, in ponds and jhils, *Calcutta Garden Collectors*!

A matted floating grass; a poor fodder.

DISTRIB.—S.-E. Asia; Australia.

221. *Oryza* Linn.

Leaves herbaceous with unarmed margins, ligule long 2-partite;  
panicle lax; awn very long . . . . . *sativa.*

Leaves coriaceous with spinulose margins, ligule very short; panicle  
spiciform; awn short, rigid . . . . . *coarctata.*

301. *Oryza sativa* Linn.; F. I. ii. 200; F. B. I. vii. 92. E. D. O 258.

Everywhere throughout the forests on the sloping alluvium of  
river-banks from the northern boundary to the sea-face, "wild, or as  
an escape from cultivation," *Heinig*!

Vernac. *Dhán*.

An annual grass; "of no economic value" (*Heinig*).

DISTRIB.—Tropical Australia.

*Heinig*'s specimens, from various localities in the Sundribun forests, give  
more the suggestion of a condition 'feral after escape' than of a truly wild stock;  
they have stouter stems and fuller ears than undoubtedly wild plants collected in  
fresh-water marshes and jhils elsewhere by King and other Indian botanists.  
Though apparently as widely spread as the next species, *O. sativa* is rare, whereas  
the next is exceedingly abundant. All *Heinig*'s specimens have very long awns.

302. *Oryza coarctata* Roxb.; F. I. ii. 206; F. B. I. vii. 93.

Everywhere in the forests on newly formed sloping alluvial river-banks, from the northern boundary to the sea-face, *Hamilton*, *Griffith*! *Ellis*! *Heinig*! *Prain*! Sea-face, on sand covered by high tides, *Prain*!

Vernac. *Bani Dhán*.

A tall, rigid perennial grass, with wiry rootstock; an excellent mud- and sand-binding plant.

DISTRIB.—Sind.

First discovered by *Hamilton* in 1796. This is the most common and most plentiful grass in the Sundribuns; it is the first species to establish itself on the compensation banks of alluvium that are formed on the opposite bank of a river whenever the 'set' of the current produces erosion. Such banks vary in size from a few square yards to several acres; wherever they occur there are closely and uniformly covered by a sheet of *Oryza coarctata*. Where the bank shelves rapidly off into deep water a narrow fringe of *Myriostachya Wightiana* is often associated with the *Oryza* at the river-edge; the upper or forest margin of such a bank becomes at times invaded by a belt of *Hargóza* (*Acanthus ilicifolius*) bushes, and by young plants of *Géngwa* (*Excæcaria Agallocha*), *Keora* (*Sonneratia apetala*), *Báen* (*Avicennia officinalis*) and the like. This belt of shrubbery gradually extinguishes the *Oryza coarctata*. If such a belt, as sometimes happens, does not form immediately, a sward of *Zoysia pungens*, mingled with tufts of *Fimbristylis ferruginea*, springs up instead on the landward side of the alluvial bank and drives the *Oryza* out. The plants of *O. coarctata* near the upper edge of such a bank rarely exceed 18 inches in height; towards the lower or river-edge they may be from 4 to 6 feet high. On the sand at the sea-face, the stems are only 4-8 inches high; they are, however, perfectly healthy and flower profusely though they are covered by every high tide. The species is one of the best sand-binders on the coast, as well as the most effective of the mud binders on these newly formed alluvial banks.

222. *Leersia* Sw.303. *Leersia hexandra* Sw.; F. B. I. vii. 94. *L. ciliata* F. I. ii. 207. E. D. L 247.

Northern clearings, in ponds, *Calcutta Garden Collectors*!

A floating grass; a good fodder.

DISTRIB.—Cosmopolitan in the Tropics.

223. *Zoysia* Willd.304. *Zoysia pungens* Willd.; F. B. I. vii. 99. *Agrostis matrella* F. I. i. 317.

Northern clearings, very common; occasionally also in narrow patches behind alluvial river-banks throughout the forests; sea-face, common.

A wiry grass; useless as fodder; an excellent sand-binder.

DISTRIB.—Shores of Mascarene Islands; S.-E. Asia; Tropical Australia; Polynesia.

This the grass that is next most common in the Sundribuns after *Oryza coarctata*; it occurs in the northern clearings where *Oryza* is not found; frequently is associated with *Oryza* at the upper or landward edge of alluvial banks; and is plentiful along the sea-face just above tide-mark.

## 224. *Imperata* Cyrill.

305. *Imperata arundinacea* Cyrill.; F. B. I. vii. 196. *Saccharum cylindricum* F. I. i. 234. E. D. 151.

Northern clearings, general.

Vernac. *Ulu*; *Unu*.

A tough grass; extensively used for thatching.

DISTRIB.—Cosmopolitan in the Tropics.

## 225. *Saccharum* Linn.

306. *Saccharum spontaneum* Linn.; F. I. i. 235; F. B. I. vii. 118. E. D. s 49.

Sea-face, general on the small sand-heaps above tide-mark, in large tussocks, *Heinig! Prain!*

Vernac. *Khágra*; *Kashiya*.

A tall coarse grass; useful as a sand-binder; may also be used for thatching and for making rough ropes.

DISTRIB.—Tropical and sub-tropical parts of Eastern Hemisphere and Australia.

## 226. *Andropogon* Linn.

Scented, tall; glumes muricated . . . . . *squarrosus*.  
Inodorous; glumes not muricated:—

Tall; joints of rachis and pedicels of upper spikelets compressed, with thickened margins and a translucent centre *intermedius*.

Short; joints of rachis opaque; tips of branches of panicle bearded *aciculatus*.

307. *Andropogon squarrosus* Linn. f.; F. B. I. vii. 186. *A. muricatus* F. I. i. 265. E. D. A 1007.

In large tussocks, on bunds, in northern clearings, *Calcutta Garden Collectors! Prain!*

Vernac. *Khas-Khas*.

A large perennial tufted grass; used elsewhere in India to make aromatic scented mats, fans, baskets and the like; root yields on distillation a fragrant oil.

DISTRIB.—Tropical Africa; India generally; Java. Possibly originally introduced to India by Arab navigators and invaders. The natural conditions are so suitable for this grass that there is no reason why it should not be wild in these northern clearings and, as a matter of fact, it is not actually cultivated

But the tussocks are so scarce that it is perhaps more probable that the grass was originally introduced by man.

308. *Andropogon intermedius* R. Br.; F. B. I. vii. 175. *A. glaber* F. I. i. 267.

Northern and western clearings, on bunds.

Vernac. *Gandha Gurúná*.

A tall grass, forming small tussocks; properties insignificant.

DISTRIB.—Tropical Africa; sub-tropical and tropical Asia; Polynesia.

309. *Andropogon aciculatus* Retz; F. I. i. 262; F. B. I. vii. 188. E. D. A 1073 and C 1053.

Northern clearings, common.

Vernac. *Chor Kanta*.

A small tufted coarse grass; a poor fodder even when young; cattle refuse it after its flowers appear.

DISTRIB.—Tropical Asia; N. Australia; Polynesia.

## 227. *Sporobolus* R. Br.

310. *Sporobolus tremulus* Kunth; F. B. I. vii. 250. *Agrostis tenacissima* F. I. i. 316.

Northern clearings, very abundant; occasional in grassy spots at forest-edge of mud-banks throughout the reserves; also at the sea-face.

A slender grass with much-matted stems (sometimes 18 in. to 2 ft. long, usually only 2-6 in. long), numerous from a hard knotted stoloniferous stock; the stolons 6-18 in. long, leafy. An indifferent fodder; a good mud-binding but less effective sand-binding species.

DISTRIB.—S. E. Asia.

This is the third most abundant of the Sundribun grasses; in the clearings it is the only really abundant grass though even there it is always more or less accompanied by *Zoysia*, with which it is sparingly associated at the upper edge of alluvial banks and still more sparingly at the sea-face.

## 228. *Chloris* Sw.

311. *Chloris barbata* Sw.; F. I. i. 329; F. B. I. vii. 292. E. D. C 1026.

Northern clearings, at Kagdip, *Prain!* and elsewhere, *Heinig & Gammie! Calcutta Garden Collectors!*

A handsome tufted grass; an indifferent fodder when young; cattle do not eat it after it flowers.

DISTRIB. Cosmopolitan in the Tropics.

## 229. *Eleusine* Gaertn.

Spikelets closely imbricate, pointing forward, not awned. *indica*.

Spikelets patent, at right angles to rachis of spike, the second glume abruptly shortly awned . . . . . *ægyptiaca*.

312. *Eleusine indica* Gært. n.; F. I. i. 345; F. B. I. vii. 293. E. D. E 186.

Northern clearings, rare, *Calcutta Garden Collectors*!

A small coarse tufted grass; an indifferent to fair fodder.

DISTRIB.—Tropics of the Eastern Hemisphere, but now introduced in tropical America.

313. *Eleusine ægyptiaca* Desf.; F. I. i. 344; F. B. I. vii. 295.

Kagdip, *Prairi*!

A prostrate tufted grass; a good fodder.

DISTRIB.—Tropics of Eastern Hemisphere, but now introduced into tropical America.

This was only met with on a small patch of artificially raised ground where coal for the forest launches is kept, and is no doubt a quite recent introduction, along with coal, from Western Bengal.

### 230. *Phragmites* Trin.

314. *Phragmites Karka* Trin. VAR. *cincta* Hook f.; F. B. I. vii. 305.

*Arundo Karka* F. I. i. 348. E. D. A 1539 and P 618.

Northern forests, *Heinig*! and clearings, *Kura*! *Clarke*! *Heinig*!  
Vernac. *Nál*.

A tall, reed-like grass; the split stems are used to make *dharma* matting, also baskets employed in marketing; they are likewise used for the dunnage of boats, walling of *pán-baris*, and the like.

DISTRIB.—Tropical and sub-tropical regions of the Eastern Hemisphere and of Australia.

### 231. *Eragrostis* Beauv.

315. *Eragrostis tenella* R. & S. VAR. *plumosa* Stapf; F. B. I.

vii. 315. *Poa plumosa* F. I. i. 337. E. D. E 263.

Northern clearings, occasional.

A slender annual grass; a good fodder.

DISTRIB.—India; Ceylon; Burma.

### 232. *Myriostachya* Hook f.

316. *Myriostachya Wightiana* Hook f.; F. B. I. vii. 327.

General in all parts of the forests, but rarely very abundant.

A tall stout perennial glabrous grass; properties much those of *Phragmites*.

DISTRIB.—Malay Peninsula.

This grass holds the fourth place in order of frequency in the true Sundribun forests, where it very usually is associated with *Oryza coarctata*. In cases where an alluvial newly formed bank slopes gently into deep water this is not, as a rule, seen;

wherever a mud-bank drops suddenly into deep water a line of *Myriostachya* marks the river-margin of the *Oryza*-field. The *Myriostachya*, however, very often occurs in localities where *Oryza* does not, and forms a fringe of reed-like grass close up to the true forest. Though generally distributed from the northern borders to the sea-face it appears nowhere to be very plentiful.

The species is doubtfully reported from S. India in the *Flora of British India*, but the only specimen of the grass from Wight's herbarium seen by the writer appears to have come from Mergui. The species has been also reported from Langkawi south of Tenasserim and has been collected by Mr. C. Curtis both in Penang and in Province Wellesley.

### 233. *Diplachne* Beauv.

317. *Diplachne fusca* Beauv.; F. B. I. vii. 329. *Poa procera* F. I. i. 332.

Sundribuns; *Calcutta Garden Collectors* (1845) !

A tall tufted grass.

DISTRIB.—Tropics of Eastern Hemisphere and Australia.

There is in the Calcutta Herbarium a Sundribun specimen of this grass, collected in 1845; it has not been reported since. It is a grass the occurrence of which in the northern clearings would not cause surprise; it should therefore be looked for, with a view to confirming this old record.

## CRYPTOGAMIA.

### LXXIII.—POLYPODIACEÆ.

#### 234. *Adiantum* Linn.

318. *Adiantum lunulatum* Burm.; Synops. Fil. 114. *Pteris lunulata* F. I. iv. (758, Ed. C. B. C.). E. D. A 506.

Jatta, growing on ruins, *Prain* !

Vernac. *Kali-jhamp*.

A tufted wiry fern; properties unimportant.

DISTRIB.—Tropical and sub-tropical regions generally.

#### 235. *Pteris* Linn.

319. *Pteris vittata* Roxb.; F. I. iv. (757, Ed. C. B. C.).  
"Delta of the Ganges," *Roxburgh* (1795).

Of this fern, obtained from the Sundribuns, *Roxburgh* has left a coloured drawing which shows that it must be very nearly related to *P. longifolia* Linn. (*P. amplexicaulis* Roxb.).

*Roxburgh*, however, distinguishes the two very carefully as follows:—

*P. vittata*: stipes rising singly from a creeping stem, long and polished: pinnæ not enlarging into a stipe-clasping base, tapering to a very long fine point and (generally) fertile for only about two-thirds their length.

*P. amplexicaulis* (*P. longifolia* Linn.); stipes in tufts, and short; when old scabrous; when young, woolly: pinnæ with enlarged stipe-clasping bases, rather obtusely pointed and fertile almost to the very points.

The other characters may be theoretically assumed to be likely to break down in the case of so common and so wide-spread a fern as *P. longifolia*, but no writer on ferns has, so far, claimed that *P. longifolia* ever has an elongated, stout, creeping rootstock. It may be that those authors are right who maintain that Roxburgh's *P. vittata* is only a badly described *P. longifolia*; it is, however, difficult for those who have had to follow Roxburgh's work elsewhere and had occasion to test its excellence and accuracy to believe in this explanation. The care and precision of Roxburgh's diagnosis are against the assumption, and the native artist who made the figure could have had no particular object in drawing a creeping rootstock if such were not before him. In any case the theory that Roxburgh and his artist were alike in error cannot be admitted till the Sundribuns have once more been carefully searched for this fern.

### 236. *Ceratopteris* Brogn.

320. *Ceratopteris thalictroides* Brogn.; Synops. Fil. 174. *Pteris succulenta* F. I. iv. (759, Ed. C. B. C.).

Rampura, among standing water in a recent and imperfect clearing, growing in ditches behind bunds, *Heinig & Gammie!* *Prain!*

Vernac. *Jangli Jhau* (*fide* Roxburgh).

A tufted succulent fern; properties unimportant.

DISTRIB.—Cosmopolitan in the Tropics.

### 237. *Asplenium* Linn.

Veins free; fronds once pinnate . . . . . *falcatum*.

Veins copiously anastomosing; fronds usually twice pinnate . . . . . *esculentum*.

321. *Asplenium falcatum* Lamk.; Synops. Fil. 208.

Northern forests, *Clarke*. Eastern forests, at Supoti, on trees, *Heinig & Gammie!*

A tufted epiphytic fern; properties unimportant.

DISTRIB.—Tropical Africa; S.-E. Asia; Polynesia.

322. *Asplenium esculentum* Presl.; Synops. Fil. 244. *A. bipinnatum* F. I. iv. (756, Ed. C. B. C.).

Northern clearings, rare; Barisal, *Clarke!*

A strong tufted fern; fronds sometimes used as a vegetable.

DISTRIB.—S.-E. Asia.

### 238. *Nephrodium* Rich.

323. *Nephrodium aridum* Hook. & Bak.; Synops. Fil. 291. *Polypodium semisagittatum* F. I. iv. (753, Ed. C. B. C.).



"Delta of the Ganges" *Roxburgh*; Sundribuns, *Clarke*.

A tufted fern; properties unimportant.

DISTRIB.—S.-E. Asia.

### 239. *Polypodium* Linn.

Fronds dimorphic, the barren ones like a sere oak-leaf, the fertile pinnatifid . . . . . *quercifolium*.

Fronds all similar:—

Fronds pinnate, drooping, often rooting at the tip *proliferum*.

Fronds simple:—

Fronds covered beneath with stellate tomentum *adnascens*.

Fronds glabrous . . . . . *irioides*.

324. *Polypodium quercifolium* Linn.; F. I. iv. (750, Ed. C. B. C.);

Synops. Fil. 367.

Everywhere common, from the northern boundary to the sea-face.

Vernac. *Gurúr*.

An epiphytic fern with two kinds of fronds; reputed medicinal, used in chest complaints.

DISTRIB.—S.-E. Asia; N. Australia.

325. *Polypodium proliferum* Roxb.; F. I. iv. (752, Ed. C. B. C.)

Synops. Fil. 315.

Northern clearings.

Vernac. *Depu*.

A terrestrial fern with creeping rhizome and drooping often rooting and proli-ferous flagelliform fronds; properties unimportant.

DISTRIB.—Tropical and sub-tropical Africa; S.-E. Asia; N. Australia; Polynesia.

326. *Polypodium adnascens* Sw.; Synops. Fil. 349. *P. pertusum*

F. I. iv. (750, Ed. C. B. C.).

Everywhere from the northern boundary to the sea-face.

A creeping epiphytic fern; properties unimportant.

DISTRIB.—Tropical Africa; S.-E. Asia.

327. *Polypodium irioides* Lamk.; Synops. Fil. 360. *P. glabrum*

F. I. iv. (750, Ed. C. B. C.).

Everywhere from the northern boundary to the sea-face.

Vernac. *Chitiya Bora*.

An epiphytic fern; properties unimportant.

DISTRIB.—Tropics of Eastern Hemisphere and Polynesia.

### 240. *Vittaria* Sm.

328. *Vittaria elongata* Sw.; Synops. Fil. 395. *Pteris angustifolia* F. I. iv (757, Ed. C. B. C.).

General, from the northern boundary to the sea-face.

An epiphytic fern ; properties unimportant.

DISTRIB.—Tropical and sub-tropical regions of the Eastern Hemisphere and Australia.

#### 241. *Drymoglossum* Presl.

329. *Drymoglossum piloselloides* Presl; Synops. Fil. 398. *Pteris piloselloides* F. I. iv. (757, Ed. C. B. C.).

Occasional only, but generally distributed.

An epiphytic fern ; properties unimportant.

DISTRIB.—S.-E. Asia (in Ceylon but not in India except Himalaya and Bengal).

#### 242. *Acrostichum* Linn.

Climbing on trees ; fertile and barren pinnæ on distinct fronds

- Terrestrial ; fertile and barren pinnæ on the same frond *palustre*.  
330. *Acrostichum palustre* Bedd. *A. scandens* Synops. Fil. 412. *aureum*.  
*Pteris scandens* F. I. iv. (758, Ed. C. B. C.).

General.

Vernac. *Dhekwa* ; *Dehia*.

A large scandent epiphytic fern ; of little economic importance ; the leaves are used as thatch.

DISTRIB.—S.-E. Asia ; N. Australia ; Polynesia.

331. *Acrostichum aureum* Linn. ; Synops. Fil. 423. *A. emarginatum* F. I. iv. (749, Ed. C. B. C.).

Northern clearings and northern forests, very plentiful.

Vernac. *Udoban*.

A rigid tufted fern ; growing in muddy places ; leaves used in thatching.

DISTRIB.—Cosmopolitan in the Tropics, especially near the sea.

### LXXIV.—OPHIOGLOSSACEÆ.

#### 243. *Helminthostachys* Kaulf.

332. *Helminthostachys zeylanica* Hook. & Bauer ; Synops. Fil. 447. *Osmunda zeylanica* F. I. iv. (748, Ed. C. B. C.).

Eastern Sundribuns in Barisal District, *Clarke* !

Vernac. *Ekbir*.

A fern with a large barren, twice palmately lobed segment, and a smaller fertile spicate segment.

DISTRIB.—Foot of Eastern Himalaya ; Lower Bengal ; Ceylon ; Malaya ; N. Australia.

## LXXV.—LYCOPODIACEÆ.

244. *Lycopodium* Linn.333. *Lycopodium Phlegmaria* Linn. F. I. iv. (746, Ed. C. B. C.).

Reserved forests, rare, *Heinig & Gammie*!

A pendulous epiphyte, stems dichotomously forked ; properties unimportant.

DISTRIB.—Tropics generally.

245. *Psilotum* Sw.334. *Psilotum triquetrum* Sw.

Eastern Sundribuns in Barisal District, *Clarke*!

A wiry tufted herb, epiphytic on roots of *Cocos nucifera*.

DISTRIB.—Cosmopolitan in the Tropics.

## VII.—NEGATIVE FEATURES OF THE SUNDRIBUN FLORA.

In the foregoing chapters our attention has been necessarily given exclusively to those species that are known to occur in the Sundribuns, because specimens from this territory actually exist in the Calcutta Herbarium, or because careful observers like Roxburgh, Clarke and Heinig have reported their presence in the region. Having regard, however, to the fact that, with some of these reported species, e.g. *Barringtonia speciosa*, reported by Heinig only, and *Ceriops Candolleana*, reported both by Clarke and by Heinig, though there is no inherent improbability in the record, there is nevertheless the possibility of some mistake in identification, it has seemed better merely to mention the fact of the record ; while a search for *all* recorded species has been urged, these quite doubtful ones have been excluded from the serial list.

This sketch of the Sundribun Flora would, however, fail to be complete without a brief reference to the general flora of which it forms an integral part, and without a list of the more salient members of this flora that have not hitherto been recorded from the Sundribuns, but that it is not impossible, where the nature of the species actually present in the Sundribuns is considered, may yet be found there. For while it is no doubt true that we probably now know all the common, and the majority of the wide-spread though rare Sundribun species, it must be recollected that the area occupied by these forests is so very extensive as to forbid its systematic exploration island by island, and that therefore in the future, as in the past, accident alone can lead to the collection of any species that is not only rare but local in

its occurrence, or of most species that, even if plentiful where they occur, are confined to restricted areas within the Sundribun region.

The nature of this Littoral Flora, of which the Sundribuns form one of the most important provinces, has been so fully and philosophically dealt with by Schimper, that little has been left for others to add to his statements and conclusions.\* Schimper's deductions are largely based on his own observations in the Malay Archipelago, though he has also made use of the observations of others, and notably of Kurz,† as regards the shores of the Andamans and Burma. Besides Schimper's classical work, however, reference may be made to two papers by the writer, wherein will be found an account of the corresponding flora in two non-Malayan localities that have not been dealt with either by Schimper or by Kurz; the shores of the Coco group at the north end of the Andamans,‡ and the Laccadive Archipelago.§ That some of the littoral species characteristic of the Strand-flora which occupies all the coasts from the Mascarenes to Melanesia will never be found in the Sundribuns is quite probable. Some of the characteristic species appear to be exclusively confined to rocky headlands or to shingle beaches, rarely if ever extending to sandy beaches and never appearing in tidal-swamps. For such species the Sundribun area affords no foothold. But for species that are to be found in tidal swamp-forests elsewhere in Malaya, Indo-China or India, the conditions that prevail in the Sundribuns are entirely suitable, and there is not a single Indo-Malayan swamp-forest species whose occurrence in our area would cause surprise. The limited extent of the sandy beaches along the Sundribun sea-face makes it conceivable that there is not sufficient accommodation for all the species that occur on sandy sea-shores elsewhere in the region occupied by this Strand-flora, but there is not in this fact a manifest reason why any particular species should be absent. Subjoined is therefore given a list of species, not hitherto reported from the Sundribuns, that are characteristic of other Indo-Malayan coasts and that therefore should be kept in mind as possible constituents of the Sundribun Flora. This list is in no sense exhaustive it merely exhibits the names of striking and familiar species common on other shores of the Bay of Bengal.

\* Schimper: *Die indo-malayische Strand flora*; Jena, 1891.

† Kurz: *Preliminary Report on the forest and other vegetation of Pegu*; Calcutt: 1875; also *Forest Flora of British Burma*; Calcutta, 1877.

‡ Prain: *Journal of the Asiatic Society of Bengal*, lx. 2, p. 283, et seq.; list of littoral species at p. 380.

§ Prain: *Botany of the Laccadives*; *Journal of the Bombay Natural History Society* vol. vii (1892) and viii (1893).

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*List of littoral species found on Indian Coasts but not yet collected in the Sundribuns.*

**Guttiferæ.**

Calophyllum inophyllum.

**Sterculiaceæ.**

Heritiera littoralis.

**Simarubeæ.**

Suriana maritima.

**Rhamneæ.**

Colubrina asiatica.

**Leguminosæ.**

Sophora tomentosa.

**Combretaceæ.**

Terminalia Catappa.

Lumnitzera coccinea.

Gyrocarpus Jacquini.

**Lythraceæ.**

Pemphis acidula.

**Rubiaceæ.**

Stephegyne diversifolia.

Guettarda speciosa.

Ixora brunnescens.

Hydrophylax maritima.

**Compositæ.**

Adenostemma viscosum.

**Goodenovieæ.**

Scævola Kœnigii.

**Sapotaceæ.**

Mimusops littoralis.

**Apocynæ.**

Ochrosia borbonica.

Tabernæmontana crispa.

**Boragineæ.**

*Cordia subcordata.*  
*Tournefortia argentea.*

**Convolvulaceæ.**

*Ipomœa denticulata.*  
*Operculina Turpethum.*

**Acanthaceæ.**

*Eranthemum succifolium.*

**Nyctagineæ.**

*Boerhaavia repens.*  
*Pisonia aculeata.*  
*Pisonia excelsa.*  
*Pisonia alba.*

**Laurineæ.**

*Hernandia peltata.*

**Euphorbiaceæ.**

*Euphorbia Atoto.*

**Cycadaceæ.**

*Cycas Rumphii.*

**Liliaceæ.**

*Gloriosa superba.*

**Gramineæ.**

*Ischæmum muticum.*  
*Thuarea sarmentosa.*  
*Lepturus repens.*  
*Spinifex squarrosus.*

All of these species deserve therefore to be looked for by future explorers in the Sundribuns. The fact that the existing list of Sundribun plants includes such species as *Brownlowia lanceolata*, *Amoora cucullata*, *Carapa obovata*, *Kleinhovia hospita*, *Desmodium umbellatum*, *Erythrina indica*, *Dalbergia torta*, *Derris sinuata*, *Mucuna gigantea*, *Cæsalpinia Nuga*, *Cynometra mimosoides*, *Intsia bijuga*, *Barringtonia racemosa*, *Sonneratia acida*, *Petunga Roxburghii*,

*Ægialitis rotundifolia*, *Launea pinnatifida*, *Azima tetracantha*, *Sarcolobus globosus*, *Ipomœa longiflora*, *Solanum trilobatum*, *Premna integrifolia*, *Clerodendron neriifolium*, *Avicennia alba*, *Salicornia brachiata*, *Arthrocnemum indicum*, *Agyneia bacciformis*, *Excoecaria Agallocha*, *Ficus Rumphii*, *Crinum asiaticum*, *Nipa fruticans*, *Mariscus albenscens*, *Fimbristylis sub-bispicata*, *Cladium riparium*, *Scirpodendron costatum*, *Paspalum distichum*, *Oryza coarctata*, *Zoysia pungens*, *Myriostachya Wightiana*, *Acrostichum palustre*, affords at once an ample proof of the suitability of the region for the great majority of the species to which attention is now directed, and a strong presumption that some at least of the plants given in that list will be found here associated with those enumerated in the census of known Sundribun species.

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